

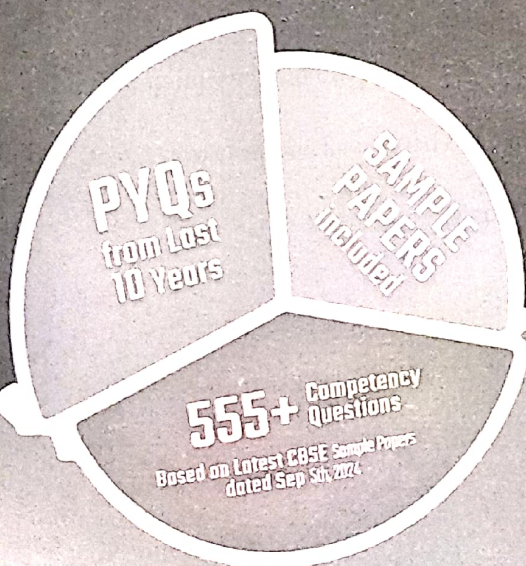
CLASS 10th
CBSE 2025



33 DAYSTM CHALLENGE

DAY 1 TO DAY 33 CHAPTERWISE
DAILY TARGETS

SCIENCE



“100% Swaha”

with **padhleakshay**

Based on CBSE Latest Sample Papers dated 05/09/24



HOW TO USE THIS BOOK?

**1****Step 1:**

Trust the book as you don't need to solve anything else than this.

Step 2:

Download our Android App 'PadhleAkshay' from the Google Playstore so that you can get access to all the notes for quick revision before solving the sums.

2**3****Step 3:**

Before starting with Day-1, have a look on the first page which gives an idea of typology of questions asked last year and the flowcharts page for brief intro to the chapter.

Step 4:

Follow it day-wise and try not to miss/skip any day in your journey.

4**5****Step 5:**

Swaha! You've solved 100% of important questions after these 33 Days. Now, just solve the given sample papers to get the grip of the latest pattern.

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###

PREFACE

Padhleakshay has become a trusted source of belief for lakhs of students since the 2020 Boards Examinations after he provided the best possible notes and a set of all important questions designed by himself and his team to all the CBSE students via his YouTube channel Padhle (@Padhleakshay).

This book stands out from all other books present in the market, **but Why?**

The reason is once again, the structure of this book, if we count the most necessary resources for CBSE Boards Exams on fingers, those would be Concise notes, Previous Years' Questions, Competency Based Questions and Sample Papers. All of these resources are packed into this book with the best possible structure of 33 Days so that your mind is very clear about taking one day at a time, and that too chapterwise, **but Why?**

The reason this book has been organised chapterwise is to make sure that you've covered all the topics with all possible typologies of questions from that particular chapter starting from Objectives, Assertion Reasons, Subjective questions and the Case based questions. Not just the questions but the answers make this book special, **but Why?**

Each and every question in this book has been designed by experts keeping in mind the latest CBSE pattern of Competency Based Questions and it's quite evident on every page with the 'COMPETENCY' label on such questions with the answers containing 'Explanation' and 'Free Advice' boxes wherever required to enhance your clarity. After all these efforts, the book has been reviewed by the 'Toppers Bench', making it the best product the market will ever witness.

Akshay has been working on this book for the last 4 months with his team. We would like to convey big thanks to all of them, especially Ayan, Aditya Kumar, Kaunain Ahmad and Anurag Yadav.

That said, we believe that there is always scope for doing things in a better manner and hence we invite you to provide us with your candid feedback and suggestions on how we can make this series even better.

#

1

Chemical Reactions and Equations



What did CBSE ask last year?

MCQs & A/R	3 Questions ($3 \times 1 = 3$ Marks)
Subjective	No Very Short Questions Asked
	1 Short Question ($1 \times 3 = 3$ Marks)
	1 Long Question ($1 \times 5 = 5$ Marks)
Case Based	No Case Based Questions Asked

Note: All the above typology of questions include 'Competency based Questions' labelled as

COMPETENCY

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Chemical Equations

- ☐ Writing a Chemical Equation
- ☐ Balanced Chemical Equations

(CBSE questions frequently to write balanced equations from chemical reactions and vice-versa)

Element	Number of atoms in reactants (LHS)	Number of atoms in products (RHS)
Zn	1	1
H	2	2
S	1	1
O	4	4

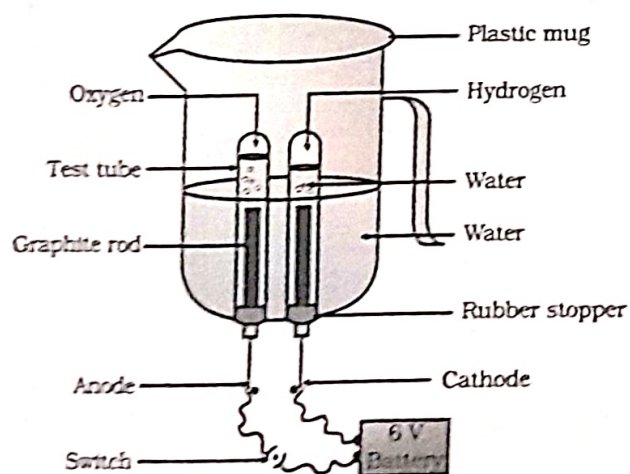
Types of Chemical Reaction

- ☐ Combination Reaction

(Quick time and slow time reactions are CBSE's favourites)

- ☐ Decomposition Reaction

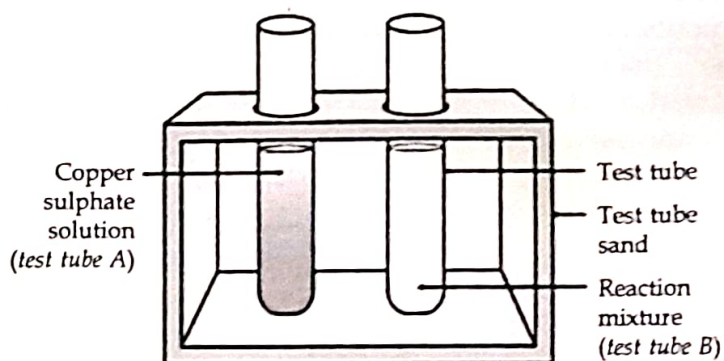
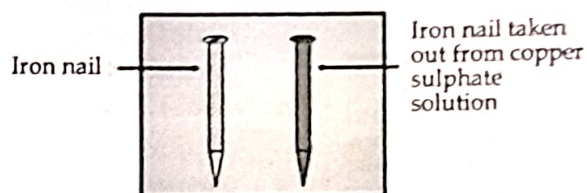
(Products of specific reactions are asked in MCQs)



**CHEM
REACTIO
EQUA**

☐ Displacement Reaction

(Colour change of solutions is asked frequently)



ICAL
NS AND
TIONS

☐ Double displacement reaction

☐ Oxidation and Reduction

(Substances oxidised, reduced and the oxidising agents and reducing agents are asked to identify very often)

OBJECTIVE QUESTIONS

(DAY 1)

Multiple Choice Questions

Q.1. Which of the following is TRUE about a combination reaction? **COMPETENCY**

- (a) The number of reactants is always greater than the number of products.
- (b) The number of products is always greater than the number of reactants.
- (c) The number of products is always equal to the number of reactants.
- (d) Any of the above can be true for different reactions.

Q.2. $w \text{ SnO}_2 + x \text{ H}_2 \longrightarrow y \text{ Sn} + z \text{ H}_2\text{O}$

For which of the following values of w , x , y and z will the equation above be balanced? **[CBSE 2024]**

- (a) $w = 1, x = 1, y = 1, z = 1$
- (b) $w = 1, x = 2, y = 2, z = 1$
- (c) $w = 1, x = 2, y = 1, z = 2$
- (d) $w = 1, x = 1, y = 1, z = 2$

Q.3. When 50g of lead powder is added to 300 ml of blue copper sulphate solution, after a few hours, the solution becomes colourless. This is an example of **COMPETENCY**

- (a) Combination reaction
- (b) Decomposition reaction
- (c) Displacement reaction
- (d) Double displacement reaction

Q.4. Gautam has to courier a sample of silver bromide powder to a laboratory for analysis.

Which of the following containers can he use to pack the sample? **COMPETENCY**

- P. Transparent glass bottle
- Q. Opaque plastic bottle
- R. Black paper packet
- (a) Only P (b) Only P or Q
- (c) Only Q or R (d) Any of P, Q or R

Q.5. A dilute ferrous sulphate solution was gradually added to the beaker containing acidified permanganate solution. The light purple colour of the solution fades and finally disappears.

Which of the following is the correct explanation for the observation? **COMPETENCY**

- (a) KMnO_4 is an oxidising agent, it oxidises FeSO_4
- (b) FeSO_4 acts as an oxidising agent and oxidises KMnO_4
- (c) The colour disappears due to dilution; no reaction is involved
- (d) KMnO_4 is an unstable compound and decomposes in presence of FeSO_4 to a colourless compound.

Q.6. Which among the following statement(s) is(are) true? Exposure of silver chloride to sunlight for a long duration turns grey due to **COMPETENCY**

- (i) the formation of silver by decomposition of silver chloride
- (ii) sublimation of silver chloride
- (iii) decomposition of chlorine gas from silver chloride
- (iv) oxidation of silver chloride
- (a) (i) only (b) (i) and (iii)
- (c) (ii) and (iii) (d) (iv) only

Q.7. When hydrogen sulphide gas is passed through a blue solution of copper sulphate, a black precipitate of copper sulphide is obtained and the sulphuric acid is formed in the solution. The reaction is an example of ____ **COMPETENCY [CBSE 2020]**

- (a) Combination reaction
- (b) Displacement reaction
- (c) Decomposition reaction
- (d) Double displacement reaction

Q.8. During an experiment, Narendra takes 2g of lead nitrate powder in the boiling tube and holds the boiling tube with a pair of tongs. He then heats it over the

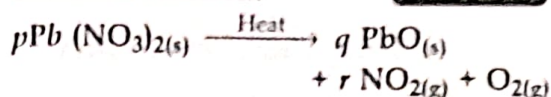
flame. After a few seconds, he sees 'X' colour fumes coming out of the tube. So, what is the colour of the fumes?

COMPETENCY [Act 1.6]

- (a) Pink (b) Red
(c) Brown (d) Colourless

Q.9. Identify p , q and r in the following balanced reaction.

COMPETENCY



- (a) 2, 2, 4 (b) 2, 4, 2
(c) 2, 4, 4 (d) 4, 2, 2

Q.10. If an iron nail is dipped in a solution of copper sulphate for 20 minutes, and the colour of the iron nail becomes brownish, what is the colour change of the copper sulphate after 20 minutes?

COMPETENCY [Act 1.9]

- (a) Colour of solution becomes green
(b) Colour of solution becomes iridescent
(c) Colour of solution becomes fade
(d) Colour of solution becomes brighter

Q.11. Solid calcium oxide reacts vigorously with water to form calcium hydroxide accompanied by liberation of heat. This process is called slaking of lime. Calcium hydroxide dissolves in water to form its solution called lime water. Which among the following is (are) true about slaking of lime and the solution formed? [CBSE 2024]

- (i) It is an endothermic reaction
(ii) It is an exothermic reaction
(iii) The pH of the resulting solution will be more than seven
(iv) The pH of the resulting solution will be less than seven
(a) (i) and (ii) (b) (ii) and (iii)
(c) (i) and (iv) (d) (iii) and (iv)

Q.12. Electrolysis of water is a decomposition reaction. The mole ratio of hydrogen and oxygen gases liberated during electrolysis of water is _____.

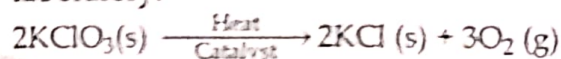
COMPETENCY [NCERT Exemplar]

- (a) 1:1 (b) 2:1
(c) 4:1 (d) 1:2

Q.13. Which of the following is (are) an endothermic processes? **COMPETENCY**

- (i) Dilution of sulphuric acid
(ii) Sublimation of dry ice
(iii) Condensation of water vapours
(iv) Evaporation of water
(a) (i) only (b) (ii) only
(c) (i) and (iv) (d) (ii) and (iv)

Q.14. The following reaction is used for the preparation of oxygen gas in the laboratory.



Which of the following statement(s) is (are) correct about the reaction?

COMPETENCY

- (a) It is a decomposition reaction and endothermic in nature
(b) It is a combination reaction
(c) It is a decomposition reaction and accompanied by release of heat
(d) It is a photochemical decomposition reaction and exothermic in nature

Q.15. Three beakers labelled as A, B and C each containing 25 mL of water were taken. A small amount of NaOH, anhydrous CuSO_4 and NaCl were added to the beakers A, B and C respectively. It was observed that there was an increase in the temperature of the solutions contained in beakers A and B, whereas in case of beaker C, the temperature of the solution falls. Which one of the following statement(s) is (are) correct? **COMPETENCY**

- (i) In beakers A and B, exothermic process has occurred.
(ii) In beakers A and B, endothermic process has occurred.
(iii) In beaker C exothermic process has occurred.
(iv) In beaker C endothermic process has occurred.
(a) (i) only (b) (ii) only
(c) (i) and (iv) (d) (ii) and (iii)

Q.16. Which among the following statement(s) is(are) true? Exposure of silver chloride to sunlight for a long duration turns gray due to _____

COMPETENCY

- (i) the formation of silver by decomposition of silver chloride
- (ii) sublimation of silver chloride
- (iii) decomposition of chlorine gas from silver chloride
- (iv) oxidation of silver chloride
- (a) (i) only (b) (ii) only
- (c) (i) and (iv) (d) (i) and (iii)

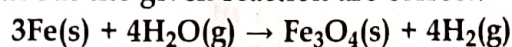
Q.17. The following reaction is an example of $4\text{NH}_3(\text{g}) + 5\text{O}_2(\text{g}) \rightarrow 4\text{NO}(\text{g}) + 6\text{H}_2\text{O}(\text{g})$

- (i) displacement reaction
- (ii) combination reaction
- (iii) redox reaction
- (iv) neutralisation reaction

COMPETENCY [NCERT Exemplar]

- (a) (i) only (b) (ii) and (iii)
- (c) (iv) and (iii) (d) (i) and (iii)

Q.18. Which of the following statements about the given reaction are correct?



- (i) Iron metal is getting oxidised
- (ii) Water is getting reduced
- (iii) Water is acting as reducing agent
- (iv) Water is acting as oxidising agent

COMPETENCY [NCERT Exemplar]

- (a) (i),(ii) and (iii)
- (b) (iii) and (iv)
- (c) (i),(ii) and (iv)
- (d) (ii) and (iv)

Q.19. Limestone $\xrightarrow[\text{Step 1}]{\text{Heated}}$ X + CO₂

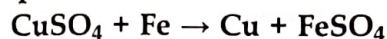
$\xrightarrow{+\text{H}_2\text{O Step 2}}$ Slaked lime

Identify the correct option from the given table which represents the type of reactions occurring in step 1 and step 2.

COMPETENCY

	endothermic	exothermic
A	×	✓
B	✓	×
C	✓	✓
D	×	×

Q.20. In the reaction of iron with copper sulphate solution:



Which option in the given table correctly represents the substance oxidised and the reducing agent **COMPETENCY**

Option	Substance Oxidized	Reducing Agent
A	Fe	Fe
B	Fe	FeSO ₄
C	Cu	Fe
D	CuSO ₄	Fe

— Assertion Reason Questions —

Following questions consist of two statements; Assertion (A) and Reason (R).

Answer these questions selecting the appropriate option given below:

- (a) Both A and R are true, and R is the correct explanation of A.
- (b) Both A and R are true, and R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

Q.1. Assertion: Most physical changes are reversible.

Reason: No new substance is formed in a physical change.

Q.2. Assertion: Formation of precipitate shows chemical change.

Reason: Chemical change cannot be reversed.

Q.3. Assertion: During electrolysis of water, water decomposes into hydrogen and oxygen.

COMPETENCY

Reason: Electrolysis of water is an endothermic reaction.

Q.4. Assertion: On heating, ferrous sulphate decomposes to form (Ferric) oxide, sulphur dioxide and sulphur trioxide.

Reason: Water of crystallisation is lost from the crystal of ferrous sulphate.

Q.5. Assertion: Reaction of Quicklime with water is an exothermic reaction.

Reason: Quicklime reacts vigorously with water releasing a large amount of heat. [CBSE 2024]

ANSWERS

Multiple Choice Answers

1. (a) 2. (c)
3. (c) When lead powder is added to a blue copper sulphate solution, a chemical reaction occurs where lead displaces copper from the copper sulphate solution as lead is more reactive than copper. This is called displacement reaction.
4. (c) 5. (a) 6. (b) 7. (d)
8. (c) **Explanation:**
$$2\text{Pb}(\text{NO}_3)_2(\text{s}) + \text{Heat} \rightarrow 2\text{PbO}(\text{s}) + 4\text{NO}_2(\text{g}) + \text{O}_2(\text{g})$$

The brown coloured fumes are nitrogen dioxide.
9. (a) 10. (a) 11. (b)
12. (b) **Explanation:**
It is so because water (i.e. a chemical compound) is made up of 2 moles of Hydrogen and 1 mole of Oxygen.
13. (d)

Free advice: A reaction in which heat is taken/given/observed is known as endothermic reaction and another which gives out energy/heat is called exothermic reaction.

14. (a)
15. (c)
16. (d)
17. (d)

FREE ADVICE: All the double displacement reactions are redox reactions, but the reverse is not true

18. (b)
19. (c)
20. (A)

FREE ADVICE: Jis compound ki reduction ho woh oxidising agent hota hai aur jo oxidise ho jaye woh hi reducing agent hota hai jaise yaha pe Fe reducing agent hai.

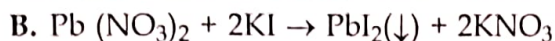
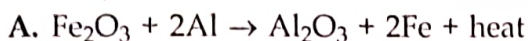
Assertion-Reason Answers

1. (a) Both A and R are true, and R is the correct explanation of A.
2. (b) Both A and R are true, and R is not the correct explanation of A.
3. (b) Both A and R are true, and R is not the correct explanation of A.
4. (a) Both A and R are true, and R is the correct explanation of A.
Explanation:
$$\text{FeSO}_4 \cdot 7\text{H}_2\text{O} \xrightarrow{\Delta} \text{Fe}_2\text{O}_3 + \text{SO}_2 + \text{SO}_3$$
5. (a) Both A and R are true, and R is the correct explanation of A.
Explanation:
Increase in the amount of heat indicates it is an exothermic reaction.

SUBJECTIVE QUESTIONS

— Very Short Answer Questions —

Q.1. Identify the type of each of the following reactions stating the reason for your answers. **COMPETENCY**



Ans. A. $\text{Fe}_2\text{O}_3 + 2\text{Al} \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe} + \text{heat}$

- **Exothermic reaction.** As heat is evolved in this reaction; or

- **Displacement reaction.** As more reactive aluminium displaces Fe from its oxides and forms oxide of Al; or

- **Redox reaction.** As aluminium reduces Fe (II) oxide to iron and itself gets oxidised to Aluminium oxide.

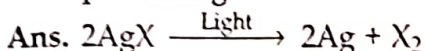


- **Double displacement reaction.** As there is an exchange of ions between reactants and products; or

- **Precipitation reaction.** As yellow ppt. of lead iodide is formed.

Q.2. Photographic film consists of a gelatin emulsion with silver halide grains layered onto a film base. The halides that are used are silver chloride, bromide or iodide. The photographic film is usually stored in metal containers to protect it from light.

Write the chemical equation for the possible chemical reaction that this method of storing photographic film is preventing. **COMPETENCY**



Q.3. Name and state the law which is kept in mind while we balanced a chemical equation? **COMPETENCY** [CBSE 2011]

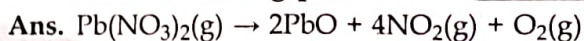
Ans. The Law of Conservation of Mass states that mass cannot be created or destroyed during a chemical reaction.

Q.4. State whether the given chemical reaction is a redox reaction or not. Justify your answer. [CBSE 2023]



Ans. This reaction is a redox reaction because MnO_2 is reduced to MnCl_2 , as oxygen is removed from MnO_2 , whereas, Hydrogen is oxidised from HCl to form H_2O .

Q.5. A metal nitrate 'A' on heating gives a metal oxide along with evolution of a brown coloured gas 'B' and a colourless gas, which helps in burning. Identify both 'A' & 'B' and write the chemical reaction taking place. **COMPETENCY**



Hence, A = Lead nitrate and B = Nitrogen dioxide and this reaction is Thermal decomposition.

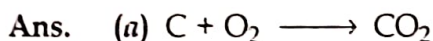
Q.6. On adding dilute HCl to copper oxide powder, the solution formed is blue-green. Predict the new compound formed which imparts a blue-green colour to the solution? [CBSE 2011]

Ans. The new formed compound is copper chloride which imparts a blue-green colour to the solution.

Q.7. While cooking in an aluminum vessel, Sudeshna burned some food till all that was left was a completely charred and black residue. She just left the blackened vessel heating on the stove. After an hour she found that the vessel was completely clean, with no trace of any blackness.

(a) Write a chemical equation to explain what happened to the charred, black residue that made it disappear.

(b) Name the type of reaction referred to in (a). **COMPETENCY**



- (b) - combustion
- oxidation
- combination

Q.8. When hydrogen gas burns in presence of oxygen, water is formed and when water is electrolysed then hydrogen and oxygen gases are produced.

State the kind of reaction that takes place:

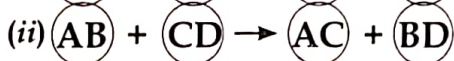
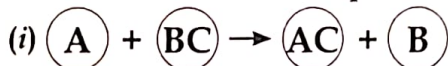
(a) In the first case

(b) In the second case [CBSE 2015]

Ans. (a) Combination reaction

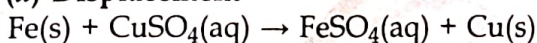
(b) Decomposition reaction

Q.9. Identify the types of reaction mentioned above in (a) and (b). Give one example for each type in the form of a balanced chemical equation

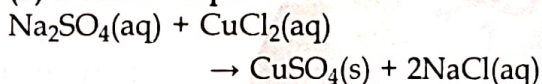


COMPETENCY

Ans. (a) Displacement

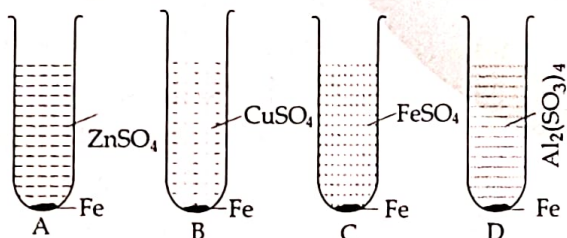


(b) Double displacement



Short Answer Questions

Q.1. Sakshi was comparing the reactivity of different metals for her science project. She added iron filings in four test tubes A, B, C, D containing aqueous solutions of ZnSO_4 , CuSO_4 , FeSO_4 and $\text{Al}_2(\text{SO}_4)_3$ respectively as shown in the figure - [CBSE 2024]



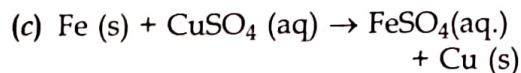
(a) In which of the test tubes she will observe the reaction to be most vigorous?

(b) What is the reason for her observation?

(c) Write a well-balanced equation of the reaction in (b).

Ans. (a) Test tube B.

(b) Copper is lower to Iron in the reactivity series so displacement reaction will be maximum.



Q.2. (a) Mention the four information given by an equation.

(b) State the law of conservation of mass as applicable in a chemical reaction. [CBSE 2013]

Ans. (a) (i) Change in state

(ii) Catalyst involved

(iii) Physical state of reactants and products

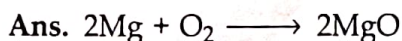
(iv) Conditions such as temperature, pressure, etc.

(b) The total mass of elements present in the reactants has to be equal to the mass of elements present in the products in a chemical reaction.

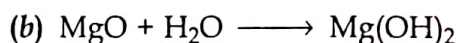
Q.3. A magnesium ribbon is burnt in oxygen to give a white compound X accompanied by emission of light. If the burning ribbon is now placed in an atmosphere of nitrogen, it continues to burn and forms a compound Y.

(a) Write the chemical formulae of X and Y.

(b) Write a balanced chemical equation, when X is dissolved in water. **COMPETENCY**



(a) X is MgO ; Y is Mg_3N_2



Q.4. State the change in colour observed in each of the following cases mentioning the reason - **COMPETENCY**

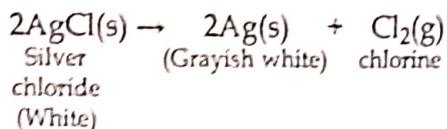
(a) Silver chloride is exposed to sunlight.

(b) A piece of zinc is dipped in ferrous sulphate solution.

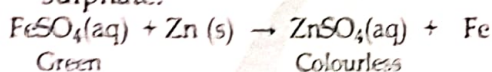
(c) Copper powder is strongly heated in air

Ans. (a) When silver chloride is exposed to sunlight, it starts to decompose and forms silver metal and chloride gas.

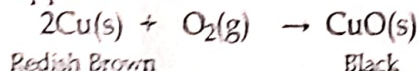
In this reaction, the white color of silver chloride changes to grayish white due to the formation of silver metal.



- (b) When a piece of zinc metal is dipped in ferrous sulphate solution, it forms ZnSO_4 and iron. In this reaction, zinc displaces iron from ferrous sulphate solution, resulting in the liberation of iron and the fading of the green color of ferrous sulphate solution due to the formation of colorless zinc sulphate.



- (c) When copper powder is strongly heated in the presence of oxygen, copper reacts with the oxygen in the air to form a black substance called copper oxide.



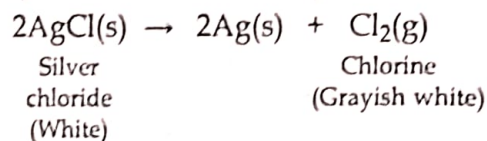
Q.5. (a) While electrolysis water before passing the current some drops of an acid are added. Why? Name the gases liberated at cathode and anode. Write the relationship between the volume of gas collected at anode and the volume of gas collected at cathode.

- (b) What is observed when silver chloride is exposed to sunlight? Give the type of reaction involved.

[CBSE 2023]

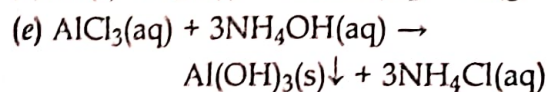
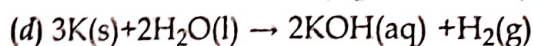
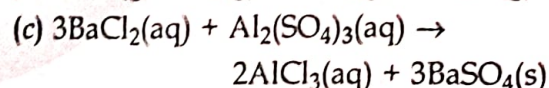
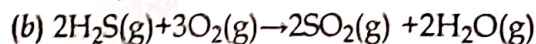
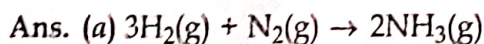
Ans. (a) While electrolyzing water, before passing the current, some drops of an acid are added because it helps in conducting electricity in water. Oxygen gas is liberated at the anode, while hydrogen gas is liberated at the cathode, and the ratio of the gases of oxygen (anode) to hydrogen (cathode) is 1 : 2 by volume.

- (b) When silver chloride is exposed to sunlight, it starts to decompose and form silver metal and chloride gas. This type of reaction is called photochemical decomposition.

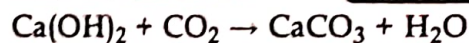


Q.6. Translate the following statements into chemical equations and then balance them:

- Hydrogen gas combines with nitrogen to form ammonia.
- Hydrogen sulphide gas burns in air to give water and sulphur dioxide.
- Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.
- Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.
- Aluminium chloride reacts with ammonium hydroxide to form a gelatinous white precipitate of aluminium hydroxide and a salt of ammonium chloride [CBSE 2013]

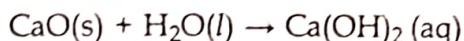


Q.7. The given reaction shows the formation of calcium carbonate **COMPETENCY**



- The above shown reaction is exothermic or endothermic?
- What is the process of formation of slaked lime?
- If any precipitate is formed, then mention its colour and common name.

- Ans. (a) Highly exothermic
 (b) When a limited amount of water is added to quicklime, slaked lime is formed.



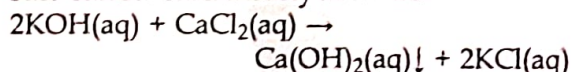
- (c) Yes, a white-colored precipitate is formed (i.e. calcium carbonate) and the common name is marble.

Q.8. What is meant by a precipitation reaction? Explain by giving an example. Also give a balanced chemical equation for the reaction stating the states of the reactants and the products formed.

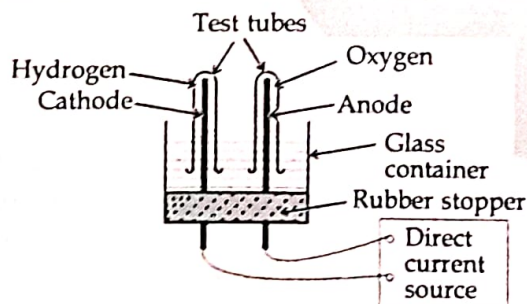
[CBSE 2013]

Ans. During the reaction of two clear solutions of ionic compounds, an insoluble substance is formed. This insoluble substance is called a precipitate, and the reaction in which a precipitate is formed is known as a precipitation reaction.

For example, when calcium chloride reacts with potassium hydroxide, it results in the formation of an insoluble salt called calcium hydroxide.



Q.9. The diagram below shows the set-up in which electrolysis of water takes place:



- (a) What type of reaction takes place?
 (b) Explain why this is an example of an endothermic reaction?
 (c) The test tube containing hydrogen is removed carefully from the apparatus. A lit match stick is brought near the mouth of this test tube. The gas burns with an explosive "pop" sound.

Write a balanced chemical equation for this reaction and indicate whether energy is absorbed or released.

- Ans. (a) Decomposition/Electrolytic decomposition
 (b) Energy in the form of electrical energy is absorbed during the decomposition.
 (c) $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2 + \text{Energy}$
 Hence, energy is released.

(DAY 2)

Long Answer Questions

Q.1. A student performed the experiment of heating ferrous sulphate crystals in a boiling tube. He smells fumes of a pungent gas and saw colours of ferrous sulphate disappear.

- (a) Name the gases produced during heating.
 (b) Write the chemical formula of the pungent gas.
 (c) State the colour of ferrous sulphate crystals both before heating and after heating.
 (d) Why does the colour of crystal disappear?
 (e) Identify the nature of this chemical reaction.

COMPETENCY

Ans. (a) During heating sulphur dioxide and sulphur trioxide are produced

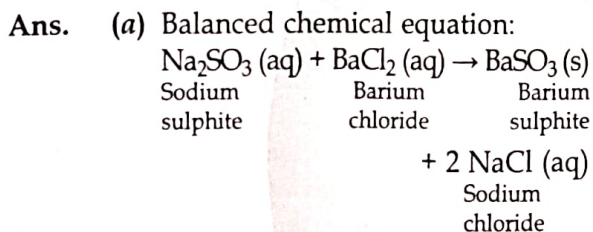
- (b) $\text{SO}_2 \rightarrow$ Sulphur dioxide
 $\text{SO}_3 \rightarrow$ Sulphur trioxide
 (c) The colour of the ferrous sulphate crystals is green before heating and changes to brown after heating. The colour of the crystals changes due to the formation of ferric oxide.
 (d) Ferrous sulphate crystals contain 7 molecules water of crystallization ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$). These crystals are green in colour. When these crystals are heated, they first lose 7 molecules of water of crystallization to form

anhydrous ferrous sulphate (FeSO_4) which is white in colour.

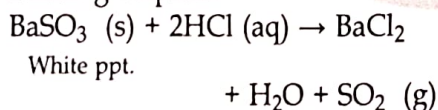
- (e) It is a thermal decomposition reaction
 $2\text{FeSO}_4 \rightarrow \text{Fe}_2\text{O}_3(\text{s}) + \text{SO}_2(\text{g}) + \text{SO}_3(\text{g})$
(green)
because, in this reaction one substance is splitting up into three substances on heating.

Q.2. On adding a drop of barium chloride solution to an aqueous solution of sodium sulphite, white precipitate is obtained. [CBSE 2024]

- (a) Write a balanced chemical equation of the reaction involved
(b) What other name can be given to this precipitation reaction?
(c) On adding dilute hydrochloric acid to the reaction mixture, white precipitate disappears. Why?



- (b) This reaction is also known as double displacement reaction.
(c) BaSO_3 is a salt of a weak acid (H_2SO_3). Therefore, dilute acid such as HCl decomposes barium sulphite to produce sulphur dioxide gas which has the smell of burning sulphur.

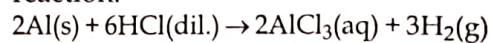


BaCl_2 is soluble in water, hence white precipitate disappears.

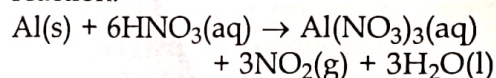
Q.3. You are provided with a container made up of aluminium. You are also provided with solutions of dil HCl , dil. HNO_3 , ZnCl_2 and H_2O . Out of these solutions which solution, can be kept in the aluminium container? Name the type of reaction taking place.

COMPETENCY

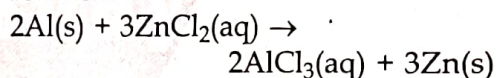
Ans. (a) Dilute HCl cannot be kept in an aluminum container because aluminum metal will react with dilute HCl to form aluminum chloride and H_2 gas. This type of reaction is called a displacement reaction.



- (b) Dil. HNO_3 cannot be kept in an aluminum container because aluminum metal reacts with dil. HNO_3 to form aluminum nitrate, and hydrogen gas evolved in this reaction is oxidized to water. Nitric acid itself is reduced to one of the oxides of nitrogen. This type of reaction is called a displacement reaction.



- (c) ZnCl_2 solution cannot be kept in an aluminum container because the more reactive aluminum will displace the less reactive zinc and form its solution (AlCl_3). This type of reaction is also called a displacement reaction.

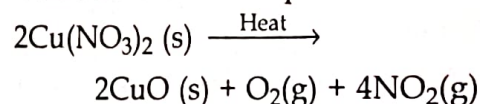


Hence, only water can be kept in the Aluminium container as no reaction takes place with water at normal temperature.

Q.4. On heating blue coloured powder of copper (II) nitrate in a boiling tube, copper oxide (black), oxygen gas and a brown gas X is formed.

- (a) Write a balanced chemical equation of the reaction.
(b) Identify the brown gas X evolved.
(c) Identify the type of reaction.
(d) What could be the pH range of aqueous solution of the gas X?

Ans. (a) Balanced chemical equation:



- (b) The brown gas X evolved is nitrogen dioxide (NO_2).
- (c) This is a decomposition reaction.
- (d) Nitrogen dioxide dissolves in water to form acidic solution because it is an oxide of non-metal. Therefore, pH of this solution is less than 7.

Q.5. A redox reaction is defined as a type of chemical reaction that involves transfer of electrons between reacting atoms, molecules or ions - one gains and the other loses electrons.

Study the equation given below that shows the reaction between zinc oxide and hydrochloric acid.



- (a) Is this a double displacement reaction? Justify your answer.
- (b) Is this a redox reaction? Justify your answer.
- (c) Name another type of reaction that this is an example of.

Ans. (a) Yes, it is.

Since there is an exchange of ions between the reactants.

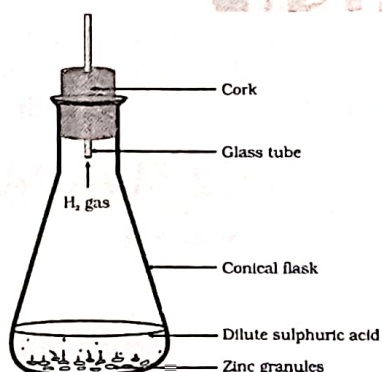
(b) No, it is not.

Since none of the reactants have gained or lost an electron.

(c) Neutralisation reaction.

CASE BASED QUESTIONS

Q.1. On Saturday afternoon, Akshay was wearing all his necessary protective equipments in chemistry lab to perform the experiment. In this experiment he takes lead nitrate solution in a test tube and adds potassium iodide solution in the test tube.



Note the changes and answer the following questions based on the given case.

- (a) Is any precipitate formed, and if so, what is the color and chemical formula of the precipitate?

COMPETENCY

- (b) What is the chemical formula of lead nitrate and potassium iodide?

- (c) Write balanced chemical reaction that took place and how many types of chemical reaction are involved, name them?

Ans. (a) Yes, a yellow-colored lead iodide PbI_2 precipitate is formed.

(b) Lead nitrate: $\text{Pb}(\text{NO}_3)_2$
Potassium iodide: KI

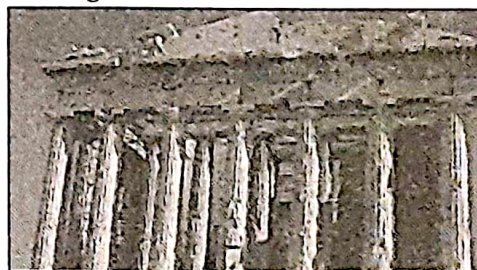
(c) $\text{Pb}(\text{NO}_3)_2 (\text{aq}) + 2\text{KI}(\text{aq}) \rightarrow \text{PbI}_2(\text{s}) \downarrow + 2\text{KNO}_3(\text{aq})$

Two types of chemical reaction are involved

(i) Precipitation reaction

(ii) Double displacement reaction

Q.2. Marble's popularity began in ancient Rome and Greece, where white and off-white marble were used to construct a variety of structures, from hand-held sculptures to massive pillars and buildings.



Answer the following questions based on the given case.

(a) Marble statues are corroded or stained when they repeatedly come into contact with polluted rain water. Identify the main reason.

(b) Calcium oxide can be reduced to calcium, by heating with sodium metal. Which compound would act as an oxidizing agent in the above process?

COMPETENCY

(c) Why marble is used for construct a variety of structures?

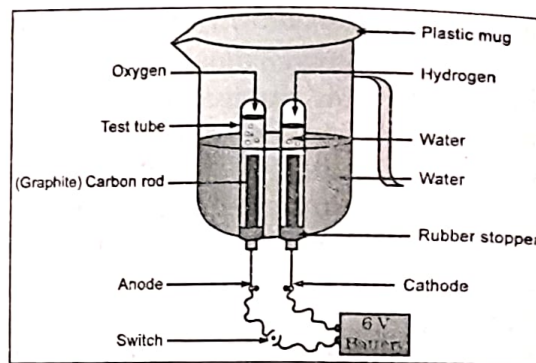
COMPETENCY

Ans. (a) Polluted water is acidic in nature; hence, it reacts with calcium carbonate.

(b) Calcium oxide.

(c) Because marble is extremely durable and gives a shiny and beautiful appearance to the structure.

Q.3. Monika performed the electrolysis of water under her teacher's supervision. First, she took a plastic mug, drilled two holes at its base, and fitted rubber stoppers in these holes. Afterward, she inserted carbon electrodes into these rubber stoppers and connected these electrodes to a 6-volt battery. She filled the mug with water until the electrodes were immersed and added a few drops of dilute sulphuric acid to the water. Then, she switched on the current and observed the electrolysis of water.



Answer the following questions based on the given case.

(a) What is the ratio of oxygen to hydrogen gas collected at the electrodes?

(b) Which gas is collected at the anode?

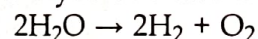
(c) Write the balanced chemical reaction for the electrolysis of water, and explain why a few drops of dilute sulphuric acid are added to water.

COMPETENCY

Ans. (a) 2 : 1

(b) Oxygen

(c) The balanced chemical reaction for the electrolysis of water is:



A few drops of dilute sulphuric acid are added to water to enhance its ability to conduct electricity.

(DAY 2 SWAHA)

2

Acids, Bases & Salts



What did CBSE ask last year?

MCQs & A/R	2 Questions ($2 \times 1 = 2$ Marks)
Subjective	No Very Short Question Asked
	1 Short Question ($1 \times 3 = 3$ Marks)
	1 Long Question ($1 \times 5 = 5$ Marks)
Case Based	No Case Based Questions Asked

Note: All the above typology of questions include 'Competency based questions' labelled as **COMPETENCY**.

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Chemical Properties of Acids and Bases

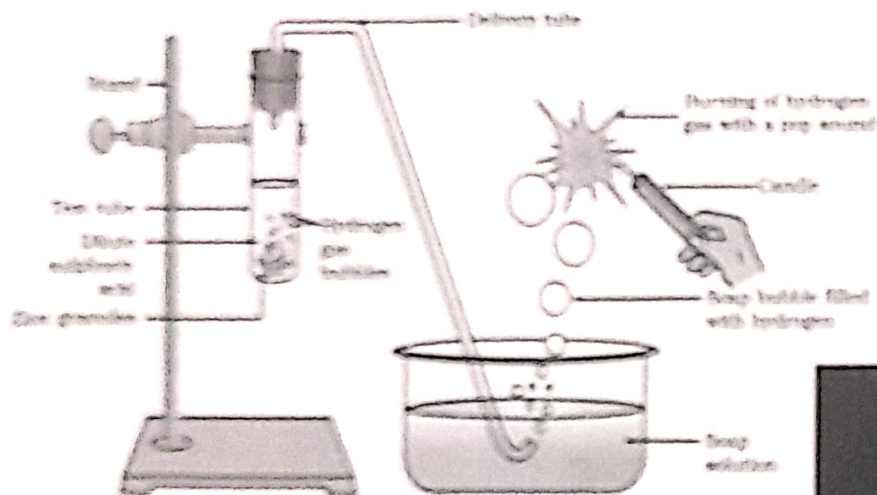
□ Reaction of Acids with Metals, Bases, Metal Carbonates and Metal Hydrogen Carbonates

(Reactivity Series will help you solve questions.)

□ Reaction of Acids with Metallic Oxides

□ Reaction of Bases with non-metallic oxides.

(Chemical formulae, reactivity and solubility are of prime importance.)

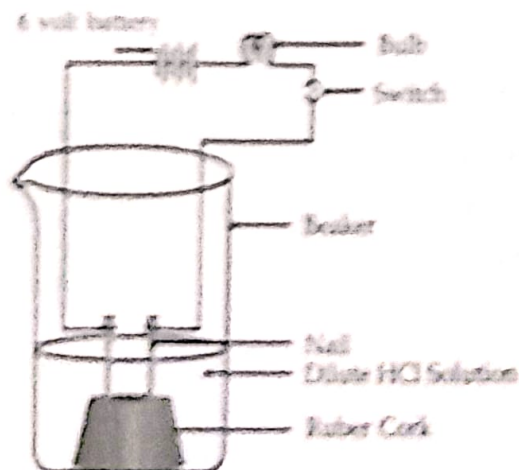


**ACIDS,
AND**

Commonalities in Acids and Bases

□ Electrical Conductivity in a Water Solution

(Questions relate around the concentration of H^+ / H_3O^+ and OH^- ions.)



- Variation in pH concentration
- Importance of pH in everyday life

The diagram shows a horizontal beam cross-section. The top surface is labeled "Oberseite" (top side). The bottom surface is labeled "Unterseite" (bottom side). The left end is labeled "A" and the right end is labeled "B". The beam is divided into two sections by a vertical line labeled "C". The left section is labeled "Außenbereich" (outer area) and the right section is labeled "Innenbereich" (inner area). The beam is shown with a dashed line representing the neutral axis. The beam is labeled "Stahlbeton" (reinforced concrete) and "OR" (Ober- und Rückwand). The beam is shown with a dashed line representing the neutral axis. The beam is labeled "Stärke von 14 cm" (thickness of 14 cm) and "Stärke von 14 cm" (thickness of 14 cm).

BASES SALTS

- ☐ Family and pH of Salts
- ☐ Chemicals from common salts
- ☐ Water of Crystallisation

The diagram illustrates a vacuum furnace setup. A central chamber is shown with two vertical cylindrical components inside. The chamber is connected to a vacuum pump system. Labels include: "Thin (inverted) retaining plate, PVC, Anhydrous, (PVC) polished" pointing to the top left; "Thin (inverted) retaining plate (in vacuum)" pointing to the top right; "Thin retaining plate" pointing to the right side; "Inlet" and "Outlet" on the left and right sides respectively; and "In the glowing zone, edge and anhydrous, paper making, without them" at the bottom right.

OBJECTIVE QUESTIONS

(DAY 3)

Multiple Choice Questions

Q.1. Which of the following reactions is a neutralisation reaction? **COMPREHENSIVE**

- (a) $4\text{Na} + \text{O}_2 \longrightarrow 2\text{Na}_2\text{O}$
- (b) $\text{Fe} + 2\text{HCl} \longrightarrow \text{FeCl}_2 + \text{H}_2$
- (c) $\text{MgO} + \text{H}_2\text{O} \longrightarrow \text{Mg}(\text{OH})_2$
- (d) $\text{HNO}_3 + \text{NaOH} \longrightarrow \text{NaNO}_3 + \text{H}_2\text{O}$

Q.2. Which of the following are properties of acids? **COMPREHENSIVE**

- P. They are bitter in taste.
- Q. They react with metals to produce hydrogen gas.
- R. They are easily soluble in water.
- (a) Only P
- (b) Only P and R
- (c) Only Q and R
- (d) All - P, Q and R

Q.3. What will happen when a burning candle is placed near a hydrogen filled bubble? **COMPREHENSIVE** [Act 2.3]

- (a) Nothing will happen
- (b) Bubble will explode
- (c) Bubble will explode with pop sound
- (d) Bubble will disappear

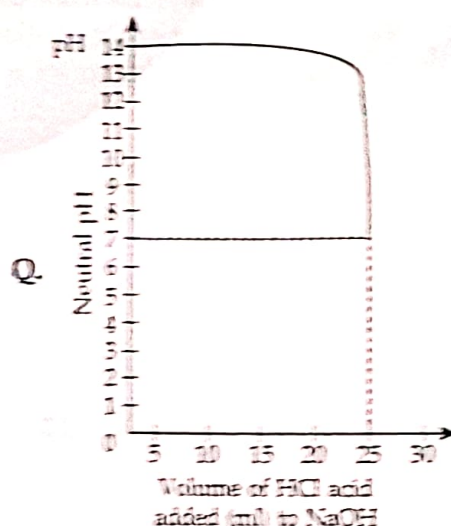
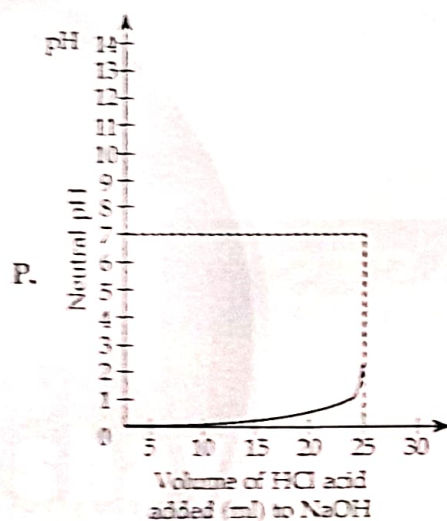
Q.4. A solution of an acid with pH 5.1 is given. Which of the following can be done to increase its pH? **COMPREHENSIVE**

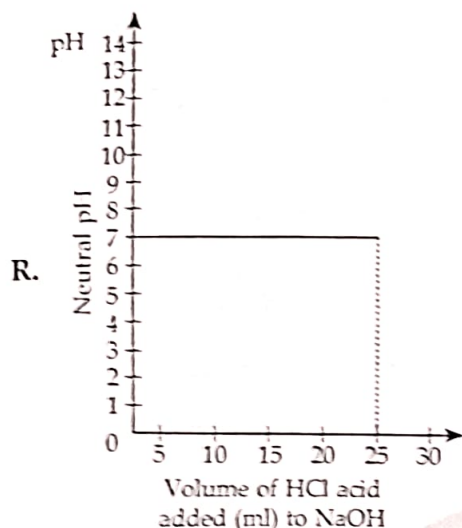
- (i) add distilled water to it
- (ii) add a solution of a different acid with pH 5.8
- (iii) add few drops of a base with an unknown pH
- (a) Only (i)
- (b) Only (iii)
- (c) Only (i) and (iii)
- (d) Any of (i), (ii) and (iii)

Q.5. Aditi adds dropwise 25 ml of concentrated HCl to 25 ml of concentrated NaOH and continuously monitors the pH in the mixture. She finds that the pH of the mixture at the end of the experiment is 7.

Which of the following graph correctly demonstrates the change in pH in the mixture during the experiment?

[CBSE 2024]





- (a) Only P
(b) Only Q
(c) Either P or Q
(d) Any of them P, Q or R

Q.6. What happens when a solution of an acid is mixed with a solution of a base in a test tube? [NCERT Exemplar]

- (i) The temperature of the solution increases
(ii) The temperature of the solution decreases
(iii) The temperature of the solution remains the same
(iv) Salt formation takes place
(a) (i) only (b) (i) and (ii)
(c) (ii) and (iii) (d) (i) and (iv)

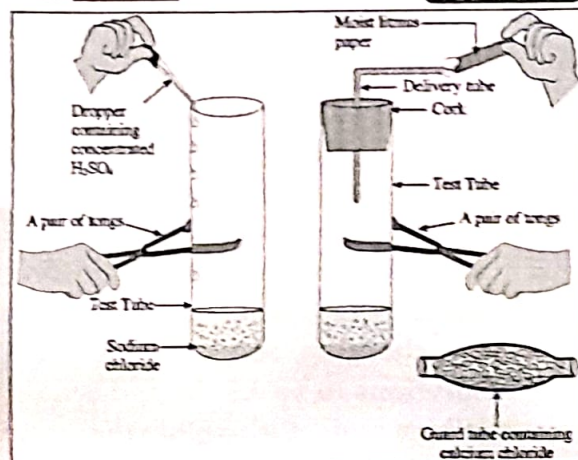
Q.7. Anand took four colourless solutions P, Q, R and S, and performed the following tests. What is the definite conclusion that Anand can reach?

	Solution P	Solution Q	Solution R	Solution S
With methyl orange	No change in colour	Turns red	No change in colour	No change in colour
With phenolphthalein	No change in colour	No change in colour	No change in colour	Turns pink
With red litmus	No change in colour	No change in colour	No change in colour	Turns litmus blue
With blue litmus	No change in colour	Turns litmus red	No change in colour	No change in colour

- (a) Both P and S are salt solutions.
(b) Both Q and S are basic solutions.
(c) Both Q and R are salt solutions.
(d) Both P and R are neutral solutions.

Q.8. The change in colour of the moist litmus paper in the given set up is due to _____

COMPETENCY



- (i) presence of acid
(ii) presence of base
(iii) presence of $H^+(aq)$ in the solution
(iv) presence of litmus which acts as an indicator
(a) (i) and (ii)
(b) Only (ii)
(c) Only (iii)
(d) Only (iv)

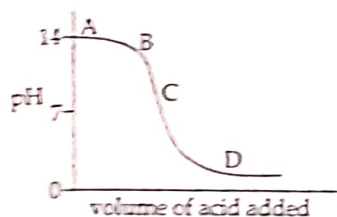
Q.9. Anita added a drop each of diluted acetic acid and diluted hydrochloric acid on pH paper and compared the colors. Which of the following is the correct conclusion?

COMPETENCY

- (a) pH of acetic acid is more than that of hydrochloric acid.
(b) pH of acetic acid is less than that of hydrochloric acid.
(c) Acetic acid dissociates completely in aqueous solution.
(d) Acetic acid is a strong acid

Q.10. The graph given below depicts a neutralization reaction (acid + alkali \rightarrow salt + water)

The pH of a solution changes as we add excess of acid to an alkali.



COMPETENCY

Which letter denotes the area of the graph where both acid and salt are present?

- (a) A (b) B (c) C (d) D

Q.11. Sonia has aqueous solutions of three salts – sodium acetate, sodium chloride and ammonium chloride in three test tubes. The test tubes are not labelled. On checking, she finds the pH of the solutions to be 4.6, 7.0 and 8.9.

Which of the following correctly matches the salts with their respective pH?

COMPETENCY

	pH 4.6	pH 7.0	pH 8.9
P	sodium acetate	sodium chloride	ammonium chloride
Q	sodium chloride	ammonium chloride	sodium acetate
R	ammonium chloride	sodium acetate	sodium chloride
S	ammonium chloride	sodium chloride	sodium acetate

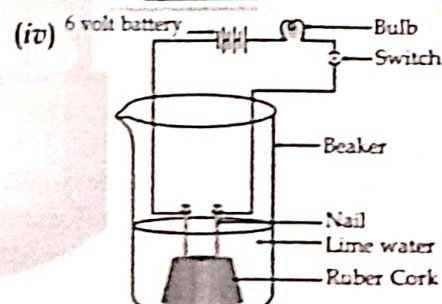
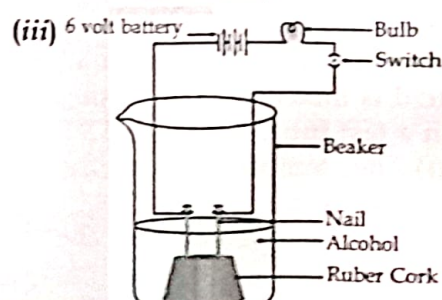
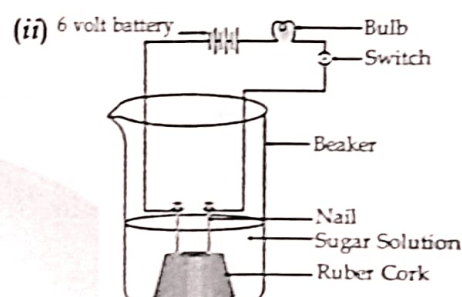
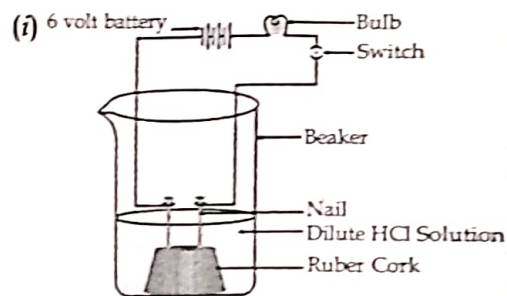
- (a) P (b) Q
(c) R (d) S

Q.12. During the preparation of HCl gas on a humid day, the gas is passed through a guard tube containing calcium chloride. What is the importance of the guard tube containing calcium chloride? [Act 2.9]

- (a) Protect the gas from surrounding
(b) Increase the rate of reaction
(c) Absorb moisture from the gas
(d) Absorb the evolved gas

Q.13. In which of the following setups would the bulb glow?

COMPETENCY



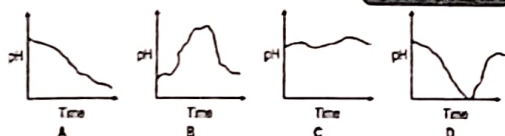
- (a) (i) and (ii) (b) (i) and (iv)
(c) (ii) (iii) & (iv) (d) (i) (ii) and (iv)

Q.14. How will you protect yourself from the heat generated while diluting a concentrated acid?

COMPETENCY

- (a) By adding acid to water with constant stirring.
(b) By adding water to acid with constant stirring.
(c) By adding water to acid followed by base.
(d) By adding base to acid with constant stirring

Q.15. Which of these graphs show how the pH of milk changes as it forms curd?



COMPETENCY

Q.16. The following table lists the pH values of some substance

Solutions	pH
Hydrochloric acid	1
milk	6
Pure Water	7
Baking Sodas	9
Sodium hydroxide	14

What would happen to the pH of an acid and a base which each is diluted (pure distilled water is added to it)?

COMPETENCY

- (a) The pH of an acid would increase and of a base would decrease
- (b) The pH of an acid would decrease and of a base would increase
- (c) The pH of an acid and a base both increase
- (d) The pH of an acid and a base remain stable

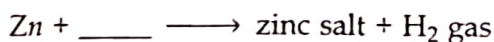
Q.17. Some activities cause the soil and water resources in that area to become acidic. Once these activities are stopped, the land has to be treated to enable plants to grow once again.

COMPETENCY

Which of the following should be added to the land to decrease the acidity permanently and allow plants to grow once again?

- (a) Water which is neutral.
- (b) Calcium oxide which is basic.
- (c) Sodium chloride which is neutral.
- (d) Dilute hydrochloric acid solution.

Q.18. A piece of zinc (Zn) - a reactive metal - was dropped into a test tube containing a substance. A zinc salt was formed and hydrogen gas was liberated. This is shown in the equation below.



Which of the following can be the substance that zinc was dropped into?

P. water

COMPETENCY

Q. hydrochloric acid

R. a solution of a zinc salt

(a) Only P

(b) Only Q

(c) Only R

(d) Either P or R

Q.19. Match the acids given in Column (A) with their correct source given in Column (B): [NCERT exemplar]

Column (A)	Column (B)
(a) Lactic acid	(i) Tomato
(b) Acetic acid	(ii) Lemon
(c) Citric acid	(iii) Vinegar
(d) Oxalic acid	(iv) Curd

(a) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

(b) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)

(c) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

(d) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)

Q.20. During the electrolysis of a brine solution _____

- (a) Chlorine gas is given off at the cathode, and hydrogen gas at the anode
- (b) Chlorine gas is given off at the anode, and hydrogen gas at the cathode
- (c) Both gases given off at the anode
- (d) Both gases given off at the cathode

Q.21. Common salt, besides being used in the kitchen, can also be used as the raw material for making _____

- (i) washing soda
- (ii) bleaching powder
- (iii) baking soda
- (iv) slaked lime
- (a) (i) and (ii)
- (b) (i), (ii) and (iv)
- (c) (i) and (iii)
- (d) (i), (iii) and (iv)

Q.22. In the list given below, a metal to the right is more reactive than a metal that is to its left.

COMPETENCY

Copper	Tin	Nickel	Cobalt	Iron	Zinc
--------	-----	--------	--------	------	------

The table below gives the colour of the metal sulphate salt solutions.

Metal salt solution	Colour of aqueous metal salt solution
Copper sulphate	blue
Tin sulphate	yellow
Nickel sulphate	green
Cobalt sulphate	pink
Iron sulphate	green
Zinc sulphate	colourless

Adding nickel and iron metal to which of the following solutions will show that iron is more reactive than nickel?

- (a) Copper sulphate
- (b) Tin sulphate
- (c) Cobalt sulphate
- (d) Zinc sulphate

Q.23. The name of the salt used to remove permanent hardness of water is _____

[CBSE 2023]

- (a) Sodium hydrogen carbonate
- (b) Sodium chloride
- (c) Sodium carbonate decahydrate
- (d) Calcium sulphate hemihydrate

Assertion Reason Questions

Following questions consist of two statements; Assertion (A) and Reason (R).

Answer these questions selecting the appropriate option given below:

- (a) Both A and R are true, and R is the correct explanation of A.
- (b) Both A and R are true, and R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

Q.1. Assertion: Acids contain hydrogen and turn blue litmus to red

Reason: Acids should not be tasted

Q.2. Assertion: Acids react with metal oxides to form salt and water

Reason: Metal oxides are acidic in nature

COMPETENCY

Q.3. Assertion: All bases are soluble in water

Reason: Bases which dissolve in water are called alkalies

COMPETENCY

Q.4. Assertion: NaOH is a strong base

Reason: NaOH ionises completely when dissolved in water

Q.5. Assertion: It is advised that while diluting an acid one should add water to acid and not acid to water keeping the solution continuously stirred.

Reason: The process of dissolving an acid into water is highly exothermic

COMPETENCY [CBSE 2022]

Q.6. Assertion: Living organisms can survive can live in wide range of pH change

Reason: Our body works within the pH range of 7.0 to 7.8.

Q.7. Assertion: Calcium chloride is a hydrated salt.

Reason: Plaster of Paris is a hydrated salt

Q.8. Assertion: After heating a few crystal of copper sulphate in a test tube it turns white in colour

Reason: Crystal of copper sulphate contains 5 molecules of water and when heated it loses its water of crystallization

COMPETENCY

Q.9. Assertion: Sodium carbonate is used for removing permanent hardness of water.

Reason: Baking soda is used in soda-acid fire extinguishers.

COMPETENCY

ANSWERS

Multiple Choice Answers

- 1. (d) 2. (c)
- 3. (c)

FREE ADVICE: Hydrogen gas is inflammable in nature and explodes with pop sound

- 4. (d) 5. (b)
- 6. (d)

FREE ADVICE: The temperature increases because all the displacement reactions like this one is exothermic in nature.

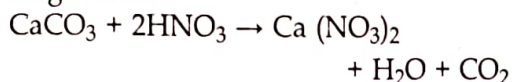
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Ans. 1. Ammonium hydroxide (NH_4OH),
Hydrochloric acid. (HCl)

2. CuSO_4 , Sulphuric acid (H_2SO_4)

Q.2. What happens when nitric acid is added to egg shell?

Ans. Egg shells contain calcium carbonate. When nitric acid is added to it, carbon dioxide gas is evolved. The reaction can be given as



Q.3. A solution of potassium chloride when mixed with silver nitrate solution, an insoluble white substance is formed. Write the chemical reaction involved and also mention the type of the chemical reaction.

Ans. $\text{KCl}(\text{aq}) + \text{AgNO}_3(\text{aq}) \rightarrow \text{AgCl}(\text{s}) + \text{KNO}_3(\text{aq})$

It is a double displacement and precipitation reaction.

Q.4. Why does dry HCl gas not change the colour of the dry litmus paper?

COMPETENCY

Ans. Colour of the litmus paper is changed by the hydrogen ions. Dry HCl gas does not contain H^+ ions. Only in the aqueous solution an acid dissociates to give ions. Since in this case, neither HCl is in the aqueous form nor the litmus paper is wet, therefore, the colour of the litmus paper does not change.

Q.5. Sugar free chewing gum, as shown below, has baking soda as one of the key ingredients and is considered to be good to keep teeth healthy. **COMPETENCY**



What is likely to be the function of baking soda in the chewing gum?

Ans. The baking soda neutralises the acids that is formed in the plaque between the teeth.

Q.6. Tooth enamel is the hardest substance in our body. Name the compound of which it is made-up of. At what pH of the mouth it gets corroded? State the role of bacteria present in the mouth. Suggest a method to prevent tooth decay. **COMPETENCY**

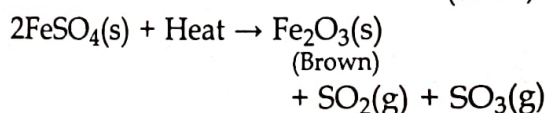
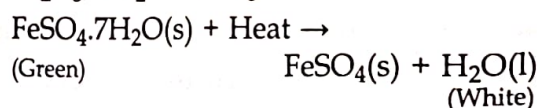
Ans. Calcium phosphate is the compound that tooth enamel is made up of. Below 5.5 pH it starts to corrode. Bacteria degrade sugar and food particle remaining in the mouth that produce acids but by using tooth paste which is generally basic it can prevent corrosion of teeth.

Q.7. The industrial process used for the manufacture of caustic soda involves electrolysis of an aqueous solution of compound 'X'. In this process, two gases 'Y' and 'Z' are liberated. 'Y' is liberated at cathode and 'Z', which is liberated at anode, on treatment with dry slaked lime forms a compound 'B'. Name X, Y, Z and B. **COMPETENCY**

Ans. Compound X = Sodium chloride (NaCl)
Compound Y = Hydrogen gas (H_2)
Compound Z = Chloride gas (Cl_2)
Compound B = Calcium Oxychloride (CaOCl_2)

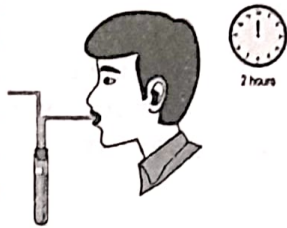
Q.8. What is the colour of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ crystals? How does this colour change upon heating? Give balanced chemical equation for the changes. [CBSE 2010,11]

Ans. $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ is green colour. When it is heated it loses its water of crystallisation and decomposes into brown coloured Fe_2O_3 , SO_2 and SO_3 .



Short Answer Questions

Q.1. Given here is an image of an experiment conducted by a student to understand the process of respiration.



He blows into a clear solution present in the test tube and sees that it turns cloudy.

COMPETENCY

- What is the most likely substance present in the test tube?
- What could be the aim of this experiment?
- What kind of respiration is shown in the experiment? Justify your answer.

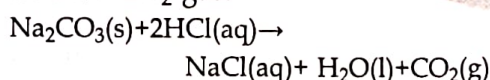
Ans. (a) Substance- lime water/dilute aqueous solution of calcium hydroxide/ $\text{Ca}(\text{OH})_2$

(b) To prove that carbon dioxide is released during respiration.

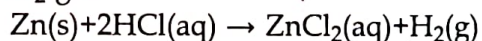
- (c) • aerobic respiration
• CO_2 is a product of either aerobic respiration or fermentation. Fermentation does not take place in human cells.

Q.2. Illustrate any three chemical properties of acids with examples? [CBSE 2016]

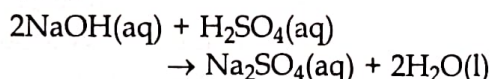
Ans. (a) They react with metal carbonates to liberate CO_2 gas.



(b) They react with metals to give out H_2 gas



(c) They react with base to form salt and water

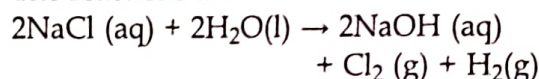


Q.3. In one of the industrial processes used for manufacture of sodium hydroxide, a gas X is formed as by product. The gas X reacts with lime water to give a compound Y which is used as a

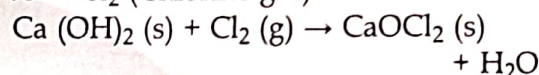
bleaching agent in chemical industry. Identify X and Y giving the chemical equation of the reactions involved.

COMPETENCY

Ans. In the manufacture of sodium hydroxide, hydrogen gas and chlorine gas (X) are formed as by-products. When chlorine gas (X) reacts with lime water, it forms calcium oxychloride (bleaching powder) Y. The reactions are -



X \rightarrow Cl_2 (Chlorine gas)



Y - Calcium oxychloride (bleaching powder)

Q.4. What happens when:

(a) CO_2 is passed through lime water in limit?

(b) CO_2 is passed through lime water in excess?

COMPETENCY

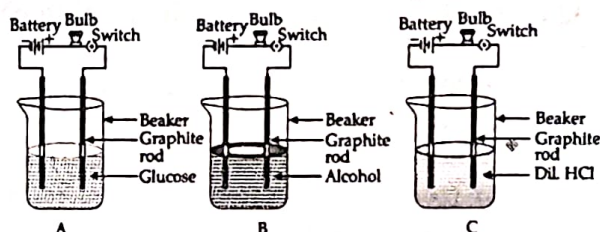
Ans. (a) $\text{Ca}(\text{OH})_2(\text{aq}) + \text{CO}_2(\text{g}) \rightarrow \text{CaCO}_3(\text{s}) \downarrow + \text{H}_2\text{O}(\text{l})$

Calcium hydroxide turns milky because of formation of insoluble white precipitates (Calcium carbonate)

(b) $\text{Ca}(\text{OH})_2(\text{aq}) + 2\text{CO}_2(\text{g}) \rightarrow \text{Ca}(\text{HCO}_3)_2(\text{aq})$

CaCO_3 gets dissolved in excess of CO_2 to form calcium hydrogen carbonate $\text{Ca}(\text{HCO}_3)_2$ which is soluble in water.

Q.5. A student takes 3 beakers A, B, & C filled with aqueous solution of glucose, alcohol & hydrochloric acid respectively as shown in the following fig:



(a) State your observation in terms of glowing of bulb when the switch is on.

- (b) Justify your observation by giving reason in each case.
 (c) Mention the change noticed with appropriate reason if the content of beaker B is replaced by sodium hydroxide solution. **COMPETENCY**

Ans. (a) Bulb C glows while bulbs A and B do not.

(b) Ions are present in dilute HCl that are responsible for the flow of current, but glucose and alcohol do not conduct electricity because they do not have ions.

(c) After replacement, bulb B glows as NaOH solution contains ions.

Q.6. (a) What will you observe when dilute hydrochloric acid is added to a small amount of copper oxide in a beaker?

(b) Aqueous solution of HCl shows acidic character. But the aqueous solution of glucose fail to do so. Why?

(c) Why curd and sour substances should not be kept in brass and copper vessels? [CBSE 2013]

Ans. (a) The copper solution becomes blue green and copper oxide dissolves
 $\text{CuO(s)} + 2\text{HCl(aq)} \rightarrow \text{CuCl}_2\text{(aq)} + \text{H}_2\text{O(l)}$

(b) Aqueous solution of glucose does not have H^+ ions, so they does not show acidic character but HCl can produce H^+ ions as they show acidic character.

(c) Curd and sour substance are acidic nature which can react with copper present in brass and form the substance poisonous

Q.7. (a) State the purpose of developing pH scale.

(b) Mention the pH range for acids.

(c) What is the pH of acid rain and how it affects the aquatic life? [2014]

Ans. (a) To determine the the amount of H^+ ions in a solution.

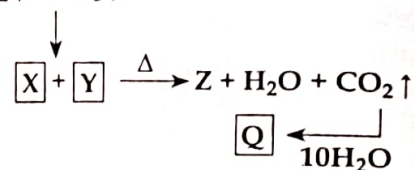
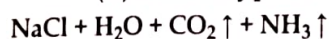
(b) 0-7 pH

(c) The pH of acid rain water is less than 5.6 results in lower the water

bodies that decrease the survival of aquatic life.

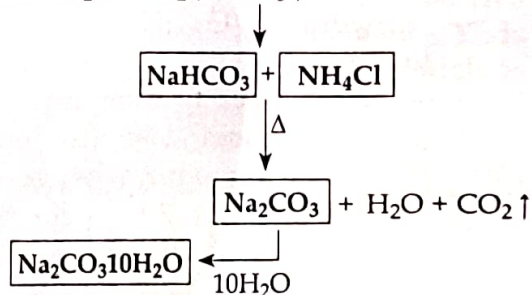
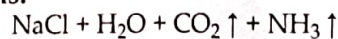
Q.8. (i) In the given series of reactions, name the compounds X and Z.

(ii) Which type of reaction is X to Z?



(iii) You are given 3 unknown solutions A, B, and C with pH values of 6, 8 and 9.5 respectively. In which solution will the maximum number of hydronium ions be present? Arrange the given samples in the increasing order of H^+ ion concentration. [CBSE 2024]

Ans.



(i) Compound X – NaHCO_3 (Sodium Hydrogen carbonate)

Compound Z – Na_2CO_3 (Sodium Carbonate)

(ii) Decomposition reaction.

(iii) Solution A will have the maximum number of hydronium ions. and increasing order of H^+ ions $\text{C} < \text{B} < \text{A}$.

Q.9. Comment on the following statements:

(i) Bee sting is treated with baking soda paste whereas wasp sting is treated with dilute vinegar.

(ii) Farmers treat soil with quicklime when tilling.

(iii) Ancient sculptures and marble structures are conserved by treating them with certain chemicals.

[CBSE 2024]

Ans. (i) Yes, baking soda is used to treat bee stings, while vinegar is used to treat wasp stings because of the different chemical properties of the venom from each insect. Bee stings are acidic, so baking soda, a basic substance, neutralizes the venom and provides relief whereas Wasp stings are mildly basic, so vinegar, an acidic substance, neutralizes the venom and provides relief.

(ii) If the soil is acidic, it affects the growth of cultivation. In order to neutralize the acidic effect, the farmer would treat the soil with quicklime or slaked lime or chalk.

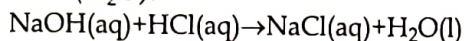
(iii) To protect sculptures from the effects of certain gases present in environment and acid rain, it is required to treat them with certain chemicals.

Q.10. (a) What property do acids and bases have in common? Explain it with an example.

(b) A compound which is prepared from gypsum has the property of hardening when mixed with water. Identify the compound and write its formula. How is this compound prepared? Describe it in the form of a chemical equation only. [CBSE 2023]

Ans. (a) Neutralization is a common property in acid and base

Example: When an acid (HCl) reacts with a base (NaOH) it forms salt (NaCl) and water (H₂O).



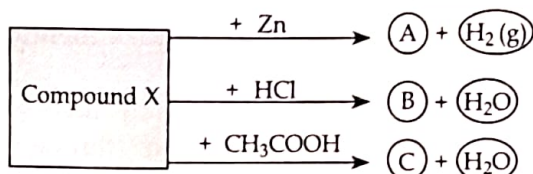
(b) Plaster of Paris is the name of the compound which is prepared by gypsum. It has the property of hardening when mixed with water. Chemical formula $\rightarrow \text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$. On heating gypsum at 373 K, it loses water molecules and becomes calcium sulphate hemihydrate $\text{CaSO}_4 \cdot 2\text{H}_2\text{O} + \text{Heat} \rightarrow \text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O} + \frac{3}{2}\text{H}_2\text{O}$

(DAY 4)

Long Answer Questions

Q.1. Identify the compound X on the basis of the reactions given below.

Also, write the name and chemical formulae of A, B and C. **COMPETENCY**



Ans. X – NaOH (Sodium hydroxide)

A – Na₂ZnO₂ (Sodium zincate)

B – NaCl (Sodium chloride)

C – CH₃COONa (Sodium acetate)

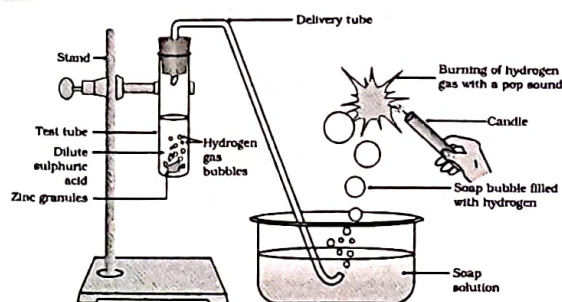
Q.2. In the following schematic diagram for the preparation of hydrogen gas as shown in figure. What would happen if following changes are made?

(a) In place of zinc granules, same amount of zinc dust is taken in the test tube.

(b) Instead of dilute sulphuric acid, dilute hydrochloric acid is taken.

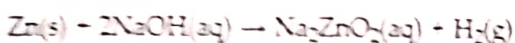
(c) In place of zinc, copper turnings are taken.

(d) Sodium hydroxide is taken in place of dilute sulphuric acid and the tube is heated. **COMPETENCY**



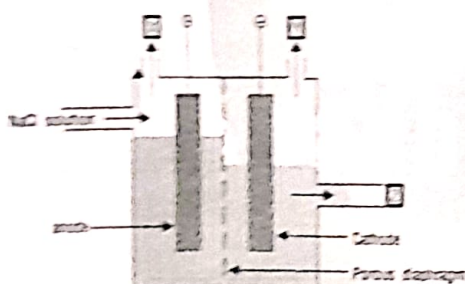
Ans. (a) Zinc dust has a comparatively larger surface area than zinc granules, resulting in a faster reaction in the test, and hydrogen gas will evolve more quickly.

- (b) Almost the same amount of gas will be evolved as both are strong acids.
 (c) No reaction will take place because copper is less reactive than hydrogen.
 (d) A reaction between NaOH and zinc will occur, and hydrogen gas will be evolved.



Q.3. I. Give any two uses of pH in everyday life other than mentioned in the context.

II. In the diagram given here when electricity is passed through an aqueous solution of a common salt. A substance 'Z' is produced along with the evolution of gases 'X' and 'Y'. When a burning matchstick is brought near the gas 'Y' it burns with a pop sound, whereas X is used for disinfecting drinking water. When gas 'X' is passed through a solution of slaked lime, an insoluble substance 'A' is produced. [CBSE 2024]



- (a) Write the name of gases 'X' and 'Y'.
 (b) Write the balanced chemical equation for the formation of substance 'A'.
 (c) Write your observations:
 (i) if a drop of blue litmus solution is added to the aqueous solution of substance 'Z'
 (ii) if methyl orange is added to substance 'Z'

Ans. I. 1. digestive system
 2. pH of soil helps to check growth of plants.
 3. pH of mouth helps to stop tooth decay.

- II. (a) $X = \text{Cl}_2$ gas, $Y = \text{H}_2$ gas
 (b) $\text{Ca(OH)}_2 + \text{Cl}_2 \rightarrow \text{CaOCl}_2 + \text{H}_2\text{O}$
 (A)

- (c) (i) It does not change to red,
 (ii) It will change into Yellow colour

Q.4. (i) Match the following pH values 1, 7, 10, 13 to the solutions given below:

- Milk of magnesia
- Gastric juices
- Brine
- Aqueous Sodium hydroxide.

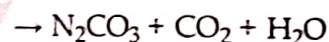
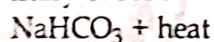
(ii) Amit and Rita decided to bake a cake and added baking soda to the cake batter

Explain with a balanced reaction, the role of the baking soda. Mention any other use of baking soda.

COMPETENCY

Ans. (i) pH of Milk of magnesia = 10
 pH of Gastric juices = 1
 pH of Brine = 7
 pH of Aqueous Sodium hydroxide = 13

(ii) Baking soda undergoes thermal decomposition to form Na_2CO_3 , CO_2 , and H_2O , CO_2 makes the cake fluffy & soft.



Uses. Used in fire extinguishers/ antacid to neutralize excess acid in stomach/to neutralize the effect of acid in insect sting.

Q.5. (a) Four samples, A, B, C, and D, change the colour of pH paper or solution to green, reddish-pink, blue, and orange. Their pH values were recorded as 7, 2, 10.5 and 6, respectively. Which of the samples has the highest concentration of hydrogen ions? Arrange the four samples in decreasing order of their pH.

(b) Rahul found that the Plaster of Paris, which he stored in a container, had become very hard and lost its binding nature. What

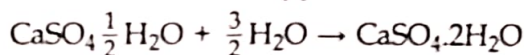
is the reason for this? Also, write a chemical equation to represent the reaction taking place.

- (c) Give one use of Plaster of Paris other than for plastering or smoothing walls.

COMPETENCY

Ans. (a) B, C > A > D > B

- (b) Due to moisture in the atmosphere it converted into Gypsum.



- (c) Gypsum is used for making toys/dolls or statues/fixing broken limbs/making decorative materials.

Q.6. (a) Write the common name of CaOCl_2 . How is it prepared? Write the chemical equation of the reaction involved in the process. Give any two uses of it.

- (b) Write the chemical name of washing soda. How is it prepared? Give the relevant chemical equations. [2012]

Ans. (a) Common name of CaOCl_2

= Bleaching powder

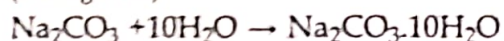
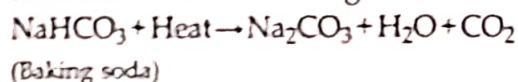
When chloride gas is passed into dry slake lime bleaching powder is formed.



Use: (i) To disinfect the drinking water
(ii) to bleach cotton

- (b) Chemical name of washing soda is Sodium Carbonate decahydrate ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$)

When baking soda is heated sodium carbonate is formed, then by recrystallisation of water in baking soda results into washing soda.

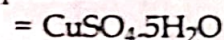


Q.7. (a) Write the chemical formula of hydrated copper sulphate and anhydrous copper sulphate. Giving an activity illustrate how these two are inter convertible.

- (b) Write chemical names and formulae of plaster of paris and gypsum.

[CBSE 2015, 17]

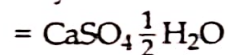
Ans. (a) Hydrated copper sulphate



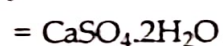
Anhydrous copper sulphate = CuSO_4

On heating $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, the water molecules evaporate and appear in the form of tiny droplets in the upper portion of the test tube. It turns into white salt. But if you moisten the crystals again, it will turn blue. Five water molecules are present in one formula of copper sulphate.

- (b) Calcium sulphate hemihydrate



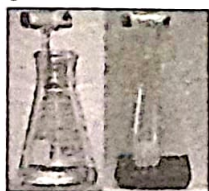
Calcium sulphate dihydrate



CASE BASED QUESTIONS

Q.1. Mahesh performed an experiment in the chemistry lab. In this experiment, he did the following things:

- (i) He took 2 ml of diluted NaOH solution in a test tube and added two drops of phenolphthalein solution.



- (ii) Then, he added diluted HCl to the above solution drop by drop.

- (iii) After that, he added NaOH once again to the above solution.

"Answer the following questions."

- (a) What is the colour of the solution when he adds phenolphthalein to 2 ml of NaOH in the first step?

- (b) What is the color and nature of the solution when HCl is added drop by drop in the second step?
- (c) Does the color of the solution change when he adds NaOH in the third step?

COMPETENCY

Ans. (a) It turns pink.

(b) The solution becomes colourless and acidic in nature.

(c) Yes, it changes back to pink.

Q.2. Monika went for a picnic with her family. The place they stayed was full of herbaceous



plants and trees. Her father cautioned her to stay away from the nettle plant and not to touch it. However, by mistake, her hand brushed against one, causing her pain. Her father immediately rubbed the dock plant on the affected area, which relieved her pain.

(a) What type of acid does the nettle plant secrete?

(b) Why did Monika's father caution her to stay away from the nettle plant?

COMPETENCY

(c) Why did her father rub the dock plant on the area where there was pain?

COMPETENCY

Ans. (a) Methanoic acid

(b) Because the nettle plant has stings on its leaves that secrete methanoic acid. If touched, it causes pain in the region.

(c) Because dock plants are basic in nature, and the base present in dock plants neutralizes the acid secreted by the nettle plant.

Q.3. The Salt Story. The salt pans in Marakkanam, a port town about 120 km from Chennai are the third largest producer of salt in Tamil Nadu.

Separation of salt from water is a laborious process and the salt obtained is used as raw materials for manufacture of various sodium compounds.

One such compound is Sodium hydrogen carbonate, used in baking, as an antacid and in soda acid fire extinguishers.

The table shows the mass of various compounds obtained when filter of sea water is evaporated.

Compound	Formula	Mass of solid Presenting
Sodium Chloride	NaCl	28.0
Magnesium Chloride	MgCl ₂	8.0
Magnesium Sulphate	MgSO ₄	6.0
Calcium Sulphate	CaSO ₄	2.0
Calcium Carbonate	CaCO ₃	1.0
Total Amount of Salt Obtained		45.0

(a) Which compound in the table reacts with acids to release carbon dioxide?

COMPETENCY

(b) How many grams of Magnesium Sulphate are present in 135g of solid left by evaporation of sea water?

COMPETENCY

(c) What is the saturated solution of Sodium Chloride called?

Ans. (a) CaCO₃

(b) 18g

MgSO₄ Present

$$= \frac{\text{Mass present}}{\text{Total Mass}} \times \text{Solid left}$$

$$= \frac{6}{45} \times 135 = 18\text{g}$$

(c) Brine

(DAY 4 SWAHA)

3

Metals & Non-metals



What did CBSE ask last year?

MCQs & A/R	2 Questions ($2 \times 1 = 2$ Marks)
Subjective	2 Very Short Questions ($2 \times 2 = 4$ marks)
	1 Short Question ($1 \times 3 = 3$ Marks)
	No Long Questions asked
Case Based	1 Question ($1 + 1 + 2 = 4$ Marks)

Note: All the above typology of questions include 'Competency based Questions' labelled as **COMPETENCY**.

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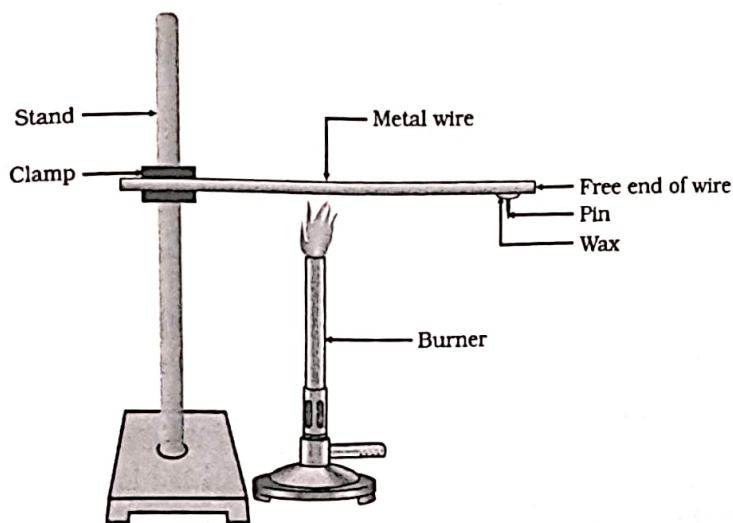
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Physical Properties

- ☐ Metals
- ☐ Non-metals

(Exceptions in physical properties are asked very often)



**METALS
NON-**

Chemical Properties of Metals

- ☐ Burning Metals in air
- ☐ Metals react with water
- ☐ Metals react with acids
- ☐ Metals react with bases
- ☐ Reactivity Series

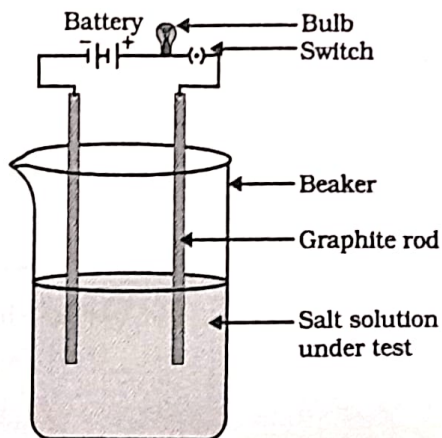
(CBSE loves to ask questions based on the reactivity series)

Potassium
Sodium
Calcium
Magnesium
Aluminium
Zinc
Iron
Lead
Hydrogen
Copper
Mercury
Silver
Gold

Reaction between Metals & Non-metals

- ☐ Electronic Configuration
- ☐ Properties of Ionic Compounds

(Short and long questions revolve around the representation of formation of ionic compounds and their properties)



**AND
METALS**

Occurrence of Metals

- ☐ Extraction of Metals
- ☐ Enrichment of Ores
- Refining of Metals

Corrosion

- ☐ Prevention of Corrosion
(CBSE loves to ask the preventive measures).

K	Electrolysis
Na	
Ca	
Mg	
Al	
Zn	Reduction using carbon
Fe	
Pb	
Cu	
Ag	Found in native state
Au	

OBJECTIVE QUESTIONS

(DAY 5)

Multiple Choice Questions

Q.1. Listed here is the reactivity of certain metals.

COMPETENCY

Metal	Reaction with air	Reaction with water	Reaction with dilute acids
Gold	Does not oxidize or burn	No reaction	No reaction
Sodium	Burns vigorously to form oxide	Violent reaction	Violent reaction
Zinc	Burns to form oxides	Reacts on heating with water	Reacts to produce hydrogen
Platinum	Does not oxidize or burn	No reaction	No reaction

Which of the above metals are likely to be obtained in their pure states from the Earth's crust?

- (a) gold only
- (b) sodium only
- (c) gold and platinum
- (d) zinc and sodium

Q.2. A cable manufacturing unit tested few elements on the basis of their physical properties

Properties	W	X	Y	Z
Malleable	Yes	No	No	Yes
Ductile	Yes	No	No	Yes
Electrical conductivity	Yes	Yes	Yes	No
Melting Point	High	Low	Low	High

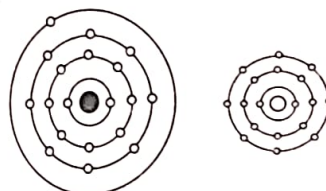
Which of the above elements were discarded for usage by the company?

COMPETENCY

- (a) W,X,Y
- (b) X,Y,Z
- (c) W,X,Z
- (d) W,X,Z

Q.3. A scientist is attempting to represent an ionic bond between calcium and chlorine. The figure below shows the progress he has made so far.

[CBSE 2024]



■ Calcium □ Chlorine

What should be the next step in his representation of the ionic bond?

- (a) Transfer an electron from the calcium atom to the chlorine atom.
- (b) Transfer an electron from the chlorine atom to the calcium atom.
- (c) Add another chlorine atom to accept an electron from the calcium atom.
- (d) Add another calcium atom to donate an electron to the chlorine atom.

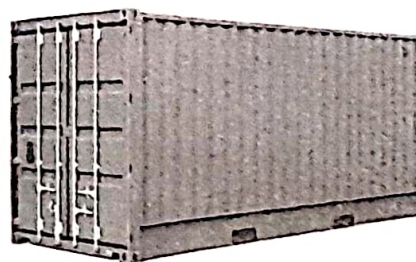
Q.4. In which of the following forms do electrovalent compounds conduct electricity?

COMPETENCY

- (a) only in solid form
- (b) both in solid form and in aqueous solution
- (c) both in aqueous solution and in molten form
- (d) in solid form, molten form and in aqueous solution

Q.5. Shown below is a container that is used in the transportation of goods over long distances.

COMPETENCY



These containers are made of steel. Which property of steel is mainly used to make these containers?

- (a) its ductility
- (b) its malleability
- (c) its metallic lustre
- (d) its electrical conductivity

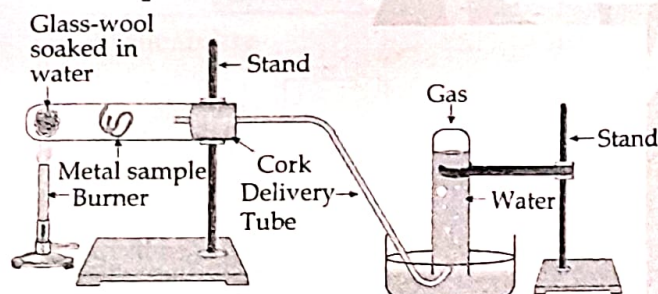
Q.6. Which of the following is amphoteric oxides?

- (i) Al_2O_3 (ii) CuO
- (iii) MgO (iv) ZnO
- (a) (i) and (ii) (b) (i) and (iii)
- (c) (ii) and (iii) (d) (i) and (iv)

Q.7. The composition of aqua-regia is

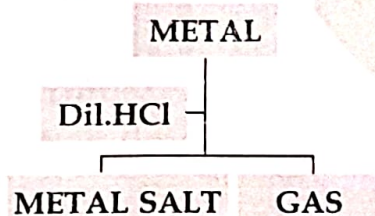
- (a) Dil.HCl : Conc. HNO_3 3 : 1
- (b) Conc.HCl : Dil. HNO_3 3 : 1
- (c) Conc.HCl : Conc. HNO_3 3 : 1
- (d) Dil.HCl : Dil. HNO_3 3 : 1

Q.8. Which gas is evolved in the following experimental setup? **COMPETENCY**



- (a) Oxygen (b) Carbon dioxide
- (c) Hydrogen (d) Helium

Q.9.



Which of the following two combinations are correct? **COMPETENCY**

	Metal	Gas Evolved
(i)	Copper	Yes
(ii)	Iron	Yes
(iii)	Magnesium	No
(iv)	Zinc	Yes

- (a) (i) and (ii) (b) (i) and (iii)
- (c) (ii) and (iii) (d) (ii) and (iv)

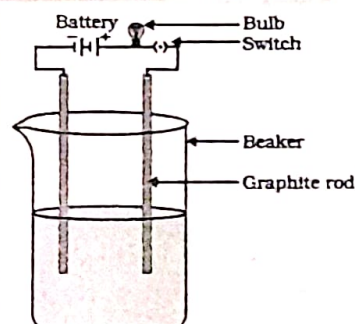
Q.10. Which one of the following shows the correct order of reactivity of metals? **COMPETENCY**

- (a) $\text{Na} > \text{Ca} > \text{Al} > \text{Mg} > \text{Fe}$
- (b) $\text{K} > \text{Ag} > \text{Au} > \text{An} > \text{Ca}$
- (c) $\text{K} > \text{Na} > \text{Ca} > \text{Mg} > \text{Al}$
- (d) None of these

Q.11. In which of the following forms do electrovalent compounds conduct electricity? **COMPETENCY**

- (a) only in solid form
- (b) both in solid form and in aqueous solution
- (c) both in aqueous solution and in molten form
- (d) in solid form, molten form and in aqueous solution

Q.12. Which of the following compound solutions will be the best to complete the following circuit? **COMPETENCY** [Act 3.13]



- (a) Glucose (b) CCl_4
- (c) NaCl (d) MgO

Q.13. Which of the following are not ionic compounds?

- (i) KCl (ii) HCl
- (iii) CCl_4 (iv) NaCl

[NCERT Exemplar]

- (a) (i) and (ii) (b) (i) and (iii)
- (c) (ii) and (iv) (d) (ii) and (iii)

Q.14. The table shown below gives information about four substances: A, B, C and D.

Substance	Melting Point (K)	Electrical Conductivity	
		Solid	Liquid/Aqueous
A	295	Good	Good
B	1210	Poor	Good
C	1890	Poor	Good
D	1160	Poor	Good

Identify ionic compounds from the above given substances.

COMPETENCY

- (a) A,B (b) B,C
(c) A,B,C (d) A,C,D

Q.15. The electronic configurations of three elements X, Y and Z are _____

X - 2, 8; Y - 2, 8, 7 and Z - 2, 8, 2

Which of the following is correct?

[NCERT Exemplar]

- (a) X is a metal
(b) Y is a metal
(c) Z is a non-metal
(d) Y is a non-metal and Z is a metal

Q.16. Given below are reactions involving metals P, Q, R and S and their salt solutions in water. **[CBSE 2024]**

Metal P salt solution + Q

→ Metal Q salt solution + P

Metal Q salt solution + R

→ Metal R salt solution + Q

Metal S salt solution + Q

→ Metal Q salt solution + S

Metal P salt solution + S → No reaction

Which metal is MOST reactive?

- (a) P (b) Q
(c) R (d) S

Q.17. What is the chemical formula of cinnabar? **COMPETENCY**

- (a) CuS (b) ZnS
(c) HgS (d) ZnO

Q.18. In which of the following processes is the thermite reaction used?

- (a) Cooking food
(b) Extraction of metals
(c) To join railway tracks
(d) Refining the ores

Q.19. Metals are refined by using different methods. Which of the following metals are refined by electrolytic refining?

- (i) Au (ii) Cu
(iii) Na (iv) K

[NCERT Exemplar]

- (a) (i) and (ii) (b) (i) and (iii)
(c) (ii) and (iv) (d) (ii) and (iii)

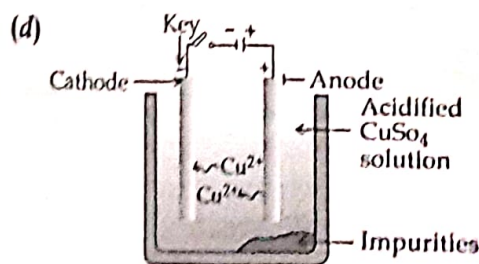
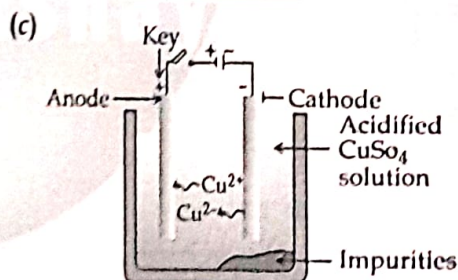
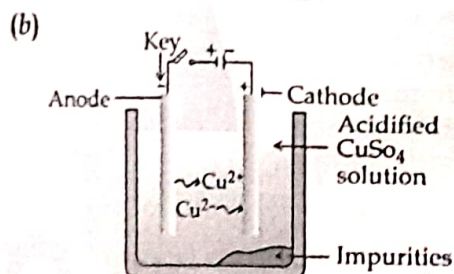
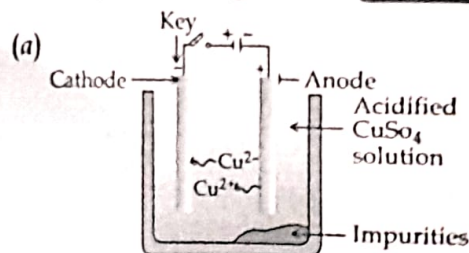
Q.20. Which of the following metals are obtained by electrolysis of their chlorides in molten state?

- (i) Na (ii) Ca
(iii) Fe (iv) Cu

[NCERT Exemplar]

- (a) (i) and (ii) (b) (i) and (iii)
(c) (ii) and (iv) (d) (ii) and (iii)

Q.21. Which one of the following figures correctly describes the process of electrolytic refining? **COMPETENCY**



Q.22. Bronze is an alloy of **[CBSE 2023]**

- (a) Copper & Zinc
(b) Aluminum and Tin
(c) Copper and Tin
(d) Copper and Mercury

Q.23. What is an amalgam?

- (a) An alloy of zinc with one or more metals
- (b) An alloy of copper with one or more metals
- (c) An alloy of mercury with one or more metals
- (d) An alloy of chromium with one or more metals

Q.24. Manav found an unknown solid substance on a riverbank. To check its nature, he carried out some tests on the substance and recorded his observations in the table shown below:

Tests	Observations
Effect of heat	melts on heating
Ductility	can be stretched into a thin strand
Malleability	can be beaten into a thin sheet
Electrical conductivity	does not conduct electricity

Which of the following could the substance be? **COMPETENCY**

- (a) It is a polymer.
- (b) It is a metal.
- (c) It is glass.
- (d) It is wax.

— Assertion Reason Questions —

Following questions consist of two statements: Assertion (A) and Reason (R).

Answer these questions selecting the appropriate option given below:

- (a) Both A and R are true, and R is the correct explanation of A.
- (b) Both A and R are true, and R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

Q.1. Assertion: Silver is the best conductor of electricity.

Reason: Conductors allow electric current to pass through them.

Q.2. Assertion: Metals are generally ductile.

Reason: Non-metals are not used to make electric wires.

Q.3. Assertion: Anodising is a process of forming a thick oxide layer of aluminium

Reason: Aluminium develops a very thick oxide layer when exposed to air.

COMPETENCY

Q.4. Assertion: Sodium metal is kept in kerosene.

Reason: Sodium is a very reactive metal.

Q.5. Assertion: Melting point and boiling point of ethanol are lower than that of sodium chloride.

Reason: The forces of attraction between the molecules of ionic compounds are very strong. **[CBSE 2023]**

Q.6. Assertion: Ionic compounds are usually solids.

Reason: Ionic compounds have high melting and boiling points.

COMPETENCY

Q.7. Assertion: You will find that the ores of many metals are oxides.

Reason: This is because oxygen is a very reactive element and is very abundant on the Earth. **COMPETENCY**

Q.8. Assertion: Iron when exposed to moist air for a long time acquires a coating of a brown flaky substance called rust.

Reason: Both air and moisture is required for rusting.

ANSWERS

— Multiple Choice Answers —

- 1. (c)
- 2. (b) Explanation: Only W was selected because it's malleable with being electrically conductive, which is a must for making wires or cables.
- 3. (c) 4. (c) 5. (b) 6. (d)
- 7. (c) 8. (c)
- 9. (d) Explanation: Fe and Zn are more reactive than H which make them able to displace H from HCl and hence evolve H_2 gas.

10. (c)

FREE ADVICE: Remember : Katrina[K], Ne[Na], Car[Ca], Mangi[Mg], Alto[Al], Zen[Zn], Ferrari[Fe], Phir bhi [(Pb)] Hanji[H], Kyu[Cu], Mili [Hg], Silver[Ag] Audi[Au]

11. (c)

12. (c) **Explanation.** Electrical conductivity requires dissociation of ions, which is easily possible in ionic compounds instead of covalent compounds like glucose and alcohol.

13. (d)

14. (b) **Explanation.** Ionic compounds are good conductor only in their aq. state cause dissociation of ions is possible only in that state

15. (d) 16. (c)

17. (c)

FREE ADVICE: Cinnabar is an ore, remember these common ores.

18. (c) 19. (a) 20. (a) 21. (d)

22. (c) 23. (c) 24. (a)

Assertion-Reason Answers

1. (b) Both A and R are true, and R is not the correct explanation of A.

2. (b) Both A and R are true, and R is not the correct explanation of A.

3. (c) A is true but R is false.

4. (a) Both A and R are true, and R is the correct explanation of A.

5. (b) Both A and R are true, and R is not the correct explanation of A.

6. (b) Both A and R are true, and R is not the correct explanation of A.

Explanation: They're generally Solids because they've very high intermolecular forces of attraction which is also the reason for it's melting point and boiling point being very high.

7. (a) Both A and R are true, and R is the correct explanation of A.

8. (c) A is true but R is false.

SUBJECTIVE QUESTIONS

Very Short Answer Questions

Q.1. Name a non-metal which is lustrous and a metal which is non-lustrous.

[CBSE 2011, 12, 17]

Ans. Lustrous non-metal is iodine Non-lustrous metal is Sodium.

Q.2. List three properties of sodium in which it differs from the general physical properties of most metals.

[CBSE 2024]

Ans. (a) It is non-sonorous.

(b) It is so soft that it can be cut with knife.

(c) It has low a melting point

Q.3. Name two metals which have very low melting point. [CBSE 2011, 12]

Ans. Sodium and Gallium

Q.4. An element X forms an oxide which turns red litmus blue. Identify whether X is a metal or non-metal.

[CBSE 2011]

Ans. The element is metal because metal forms oxides which are basic in nature.

Q.5. Write balanced chemical equation for the reaction:

Aluminium when heated in air. Write the name of the product. [CBSE 2012]

Ans. $4\text{Al} + 3\text{O}_2 \rightarrow 2\text{Al}_2\text{O}_3$

The product formed is Aluminium oxide.

Q.6. If an iron nail is placed in a copper sulfate solution, what will be the colour of the copper sulfate solution after 20 minutes, and can you write the balanced chemical reaction?

COMPETENCY [Act 3.12]

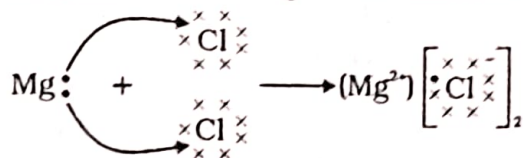
Ans. The solution of copper sulphate turns green after 20 minutes.

As for the balanced chemical reaction, it would be:

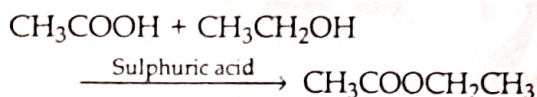
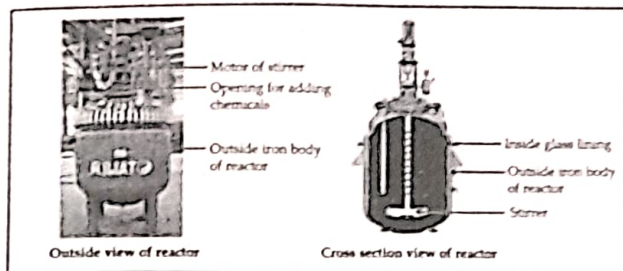
$\text{Fe(s)} + \text{CuSO}_4(\text{aq}) \rightarrow \text{FeSO}_4(\text{aq}) + \text{Cu(s)}$

Q.7. With the help of a dot structure, show the formation of magnesium chloride.

Ans.



Q.8. Many chemical reactions like the one shown below, are carried out in glass-lined, iron chemical reactors instead of directly in iron reactors. [CBSE 2024]



State one advantage of carrying out the reaction in a glass-lined reactor instead of directly in an iron reactor.

Ans. No corrosion of the reactor, and No contamination of the product with metal/metal salts.

Q.9. What is formed when sodium absorbs moisture from air? Give equation also. [CBSE 2013]

Ans. $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$
Sodium hydroxide is formed.

Q.10. Why hydrogen gas is not evolved when a metal reacts with nitric acid? [CBSE 2013]

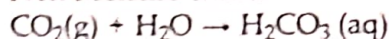
Ans. It is because HNO_3 is a strong oxidising agent. It oxidises H_2 produced to water and itself gets reduced to any of the nitrogen oxides (N_2O , NO , NO_2).

Q.11. An element forms an oxide A_2O_3 which is acidic in nature. Identify if A as a metal or non-metal.

[NCERT Exemplar]

Ans. Metallic oxides are usually basic.
 $\text{MgO(s)} + \text{H}_2\text{O} \rightarrow \text{Mg(OH)}_2\text{(aq)}$

Non-Metallic oxides are acidic.



Hence, A is non metal.

Q.12. When sodium chloride, potassium iodide, and barium chloride are burned in the presence of oxygen, what colour flames do they produce?

COMPETENCY [Act 3.13]

Ans. NaCl gives orange yellow, KI gives violet and BaCl_2 gives green coloured flames.

Short Answer Questions

Q.1. The electronic configuration of some elements is given in the table below.

Element	Electronic configuration
P	2, 8, 8
Q	2, 8, 8, 1
R	2, 6
S	2, 5
T	2, 8, 2
U	2, 8, 7

(a) Identify any two pairs of elements that will react to form compounds by a transfer of electrons.

(b) Write the molecular formula of the compounds formed by the pairs of elements identified in (a). [CBSE 2024]

Ans. (a) • Q and U • Q and R
• T and U • T and R
(b) • Q_2R • QU
• TR • TU_2

Q.2. Name the following:

(a) A metal which is preserved in kerosene.

(b) A lustrous coloured non-metal.

(c) A metal which can melt while kept on palm.

(d) A metal which is a poor conductor of heat. [CBSE 2013]

Ans. (a) A metal which is preserved in kerosene - Sodium

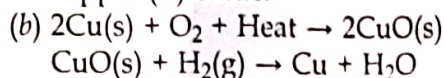
- (b) A lustrous coloured non-metal - Iodine.
 (c) A metal which can melt while kept on palm - Gallium.
 (d) A metal which is a poor conductor of heat - Mercury.

Q.3. A reddish brown metal used in electrical wires when powdered and heated strongly turns black. When hydrogen gas is passed over this black substance, it regains its original colour. Based on this information answer the following questions:

COMPETENCY

- (a) Name the metal and the black substance formed.
 (b) Write balanced chemical equations for the two reactions involved in the above information. [CBSE 2023]

Ans. (a) The reddish-brown metal is copper, and the black substance formed is copper (II) oxide.



Q.4. A metal 'M' on reacting with dilute acid liberates a gas 'G'. The same metal also liberates gas 'G' when it reacts with a base.

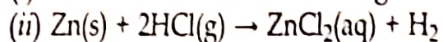
COMPETENCY

- (a) Write the name of gas 'G'.
 (b) How will you test the presence of this gas?
 (c) Write chemical equations for the reactions of the metal with:
 (i) an acid and (ii) a base

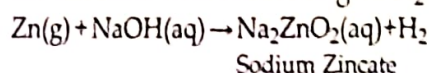
Ans. (a) Gas 'G' is H_2 gas.

(b) The gas produced in the experiment is passed through the soap solution. The bubbles of the gas evolved will be formed. When a burning candle is brought near the gas-filled bubble, the gas filled in the bubble burns with a popping sound, which is the characteristic property of H_2 gas.

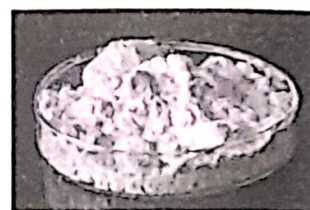
(c) (i) Zn can react with dil. HCl to give H_2



Zn can react with NaOH to give H_2



Q.5. (i) Anirudh took two metal oxides – aluminium oxide and magnesium oxide as shown in the given pictures. But he forgot to label them. How will you guide/help Anirudh to identify the oxides and label them?

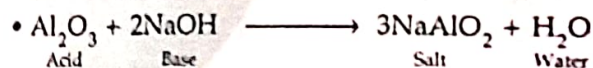


(ii) In an activity, Aishu was given two substances; Copper Sulphide (Cu_2S) and Copper Oxide (Cu_2O) to obtain copper from these compounds. She was able to extract Copper successfully. Illustrate with the help of chemical equations how Aishu might have completed the activity. [CBSE 2023]

Ans. (i) Chemical reaction Test

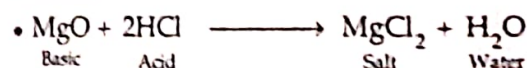


$\therefore \text{Al}_2\text{O}_3$ gives salt and water when reacted with an acid thus it is basic in nature.



$\therefore \text{Al}_2\text{O}_3$ gives salt and water when reacted with a base thus it is acidic in nature too which shows that Aluminium oxide is amphoteric in nature.

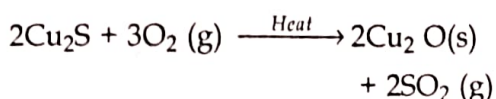
Thus aluminium oxide shows both acidic as well as basic behaviour and does not change the colour of either blue or red litmus.



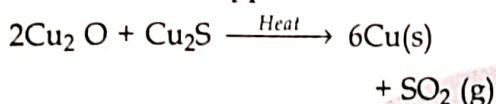
This reaction shows that MgO is basic in nature and turns red litmus blue.

(ii) Copper is found as Cu_2S in nature.

The concentrated Cu_2S is roasted in presence of air and Cu_2O is formed.



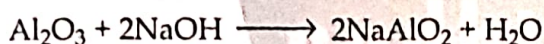
Copper oxide (Cu_2O) is then heated in the absence of air. This reduces Cu_2O into copper metal. The copper obtained is called blister copper because SO_2 produced during this reaction gets trapped inside its surface causing blisters to appear on the surface of copper metal.



Q.6. Metal 'A' is used in the thermite process as a reducing agent. When 'A' is heated with oxygen it gives an oxide 'B' which is amphoteric in nature. Identify A and B. Illustrate with the help of chemical equations the reaction of B with HCl and NaOH respectively.

Ans. (A) - Aluminium

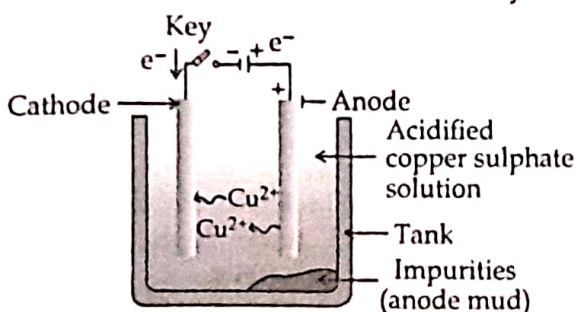
(B) - Al_2O_3



Q.7. Describe electrolytic refining of copper with chemical equations. Draw a well labelled diagram for it.

[CBSE 2014, 17, 18]

Ans. In this process, the impure metal is made the anode and a thin strip of pure metal is made the cathode. A solution of the metal salt is used as an electrolyte.



The apparatus is set up as shown in Figure. On passing the current through the electrolyte, the pure metal from the

anode dissolves into the electrolyte. An equivalent amount of pure metal from the electrolyte is deposited on the cathode. The soluble impurities go into the solution, whereas, the insoluble impurities settle down at the bottom of the anode and are known as anode mud.

At anode: $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^-$

At Cathode: $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$

Q.8. Which method will you use to reduce the following?

(a) Oxides of less reactive metals

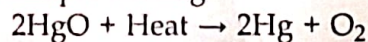
(b) Oxides of moderately reactive metals

(c) Oxides of highly reactive metals.

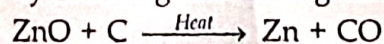
Explain by giving a suitable example

COMPETENCY

Ans. (a) Simple heating



(b) By reducing them using carbon



(c) By electrolytic reduction of their molten chlorides or oxides. e.g. Na from NaCl.

Q.9. Define alloys. List the properties of alloys that makes them useful over pure metals. Explain this fact with suitable examples. [CBSE 2013]

Ans. An alloy is a homogeneous mixture of two or more metals or a metal and a non-metal.

(a) Stainless steel is highly resistant to rust.

(b) In its pure state, iron is very soft, but iron alloys are very strong.

Q.10. (a) Define the terms 'alloy' and 'amalgam'. Name the alloy used for welding electric wires together. What are its constituents?

(b) Name the constituents of the following alloys (i) Brass (ii) Stainless steel (iii) Bronze. State one property in each of these alloys, which is different from its main constituents. [CBSE 2014]

Ans. (a) An alloy is a homogeneous mixture of two or more metals, or a metal and a non-metal.

An Alloy of a metal with mercury is called amalgam.

- (b) (i) Brass = Copper and zinc are mixed together to make brass. Brass is used for applications where low friction is required such as locks, gears, bearings etc.
 (ii) Stainless steel = Chromium + iron + carbon & nickel etc.
 (iii) Bronze = Copper and tin
 Stainless steel are highly resistive towards rust, brass and bronze have low electrical conductivity than their constituent metals.

(DAY 6)

Long Answer Questions

Q.1. (a) List in tabular form three chemical properties on the basis of which we can differentiate between a metal and a non-metal.

(b) Give reasons for the following:

- (i) Most metals conduct electricity well.
 (ii) The reaction of Iron (III) oxide [Fe_2O_3] with heated aluminium is used to join cracked machine parts.

[2019]

Ans. (a) Difference table

	Non-metals	Metals
(i)	Non-metals have a tendency to accept electrons.	Metals have a tendency to give electrons.
(ii)	Oxides of non-metals are generally basic in nature.	Oxides of metals are generally acidic in nature.
(iii)	Non-metals do not react with H_2O .	Metals react with H_2O & evolve hydrogen gas.

(b) (i) Because metals have free electrons to conduct electricity.

(ii) The reaction Fe_2O_3 reacts when heated with aluminium is called the thermite reaction, and it is highly exothermic, resulting in the formation of molten metal, it is used to join cracked parts of machines and railway tracks.

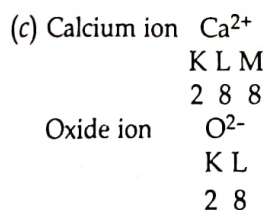
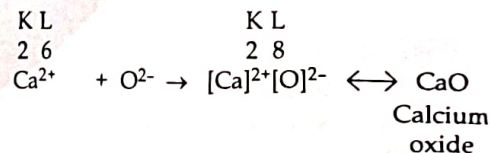
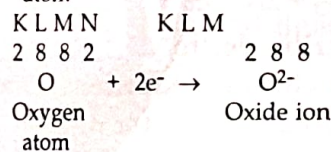
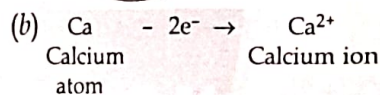
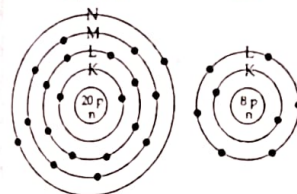
Q.2. (a) Write electron dot structures of Ca and O.

(b) Show the formation of calcium oxide by transfer of electrons.

(c) Name the ions present in this compound.

(d) List four important characteristics of this compound.

Ans. (a) Ca (At. No. 20) O (At. No. 8)
 2, 8, 8, 2 2, 6



(d) Four characteristics of ionic compound:

- (i) They have high melting and boiling points.
 (ii) They only conduct electricity in their molten state.
 (iii) They are generally hard and solid.

- (iv) They are mostly soluble in water but insoluble in solvents like kerosene and alcohols etc.

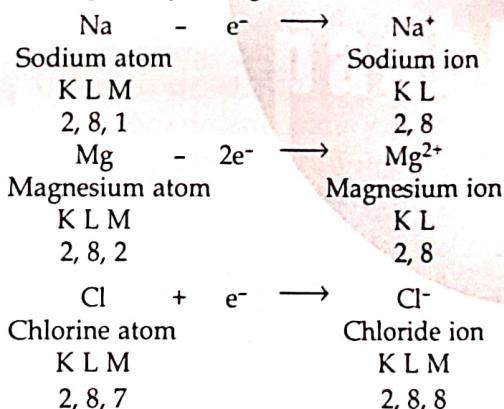
Q.3. (a) Show the formation of magnesium chloride and sodium chloride by transfer of electrons.

(b) Identify the ions present in these compounds.

(c) Why do ionic compounds not conduct electricity in the solid state? [CBSE 2012]

Ans. (a) In the outermost shell of magnesium and sodium have 2 and 1 electron respectively and they both lose their electrons to achieve the inert gas electron configuration of 8 valance electrons and form positively charged ions.

But Cl has 7 electrons in its atom so it gains one electron to achieve inert gas configuration and forms negatively charged ion.

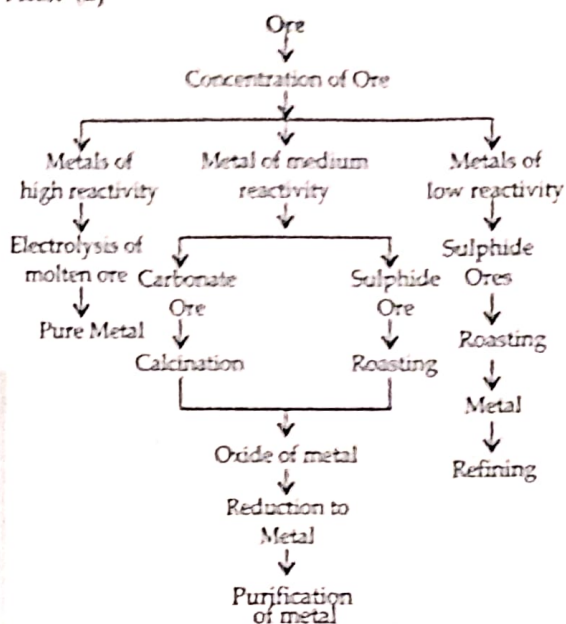


- (b) NaCl has one chloride ion [Cl⁻] and one sodium ion [Na⁺]
MgCl₂ has two chloride ion [Cl⁻] and one magnesium [Mg²⁺]
(c) Because of their rigid structure movements of ions are not possible in solid state

Q.4. (a) Draw a flow diagram to show extraction of metals of medium reactivity from their sulphide ore.

(b) Differentiate between roasting and calcination **COMPETENCY**

Ans. (a)



(b) **Difference table:**

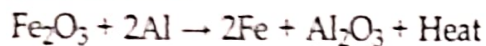
	Roasting	Calcination
(i)	Ores are strongly heated in presence of air to convert into oxide compound.	Ores are strongly heated in absence of air to convert into oxide.
(ii)	It is used for sulphide ores. <i>Example.</i> $2\text{Zn} + 3\text{O}_2 \rightarrow 2\text{ZnO} + 2\text{O}_2$	It is used for carbonate ores. <i>Example.</i> $\text{ZnCO}_3 \rightarrow \text{ZnO} + \text{CO}_2$

Q.5. (a) What is thermit process? Where is this process used? Write balanced chemical equation for the reaction involved.

- (b) Where does the metal aluminium, used in the process, occur in the reactivity series of metals?
(c) Name the substances that are getting oxidised and reduced in the process. [CBSE, 2020]

Ans. (a) The reduction of a metal oxide to form metal by using aluminium powder as a reducing agent is called thermite process or reaction.

A thermite reaction (or thermit process). A mixture of iron (III) oxide and aluminium powder is ignited with a burning magnesium ribbon. Aluminium reduces iron oxide to produce iron metal with the evolution of lot of heat. Due to this heat, iron metal is produced in the molten state.



The molten iron is then poured between the broken iron pieces to weld them (to join them).

- (b) Aluminum is used as a reducing agent in cases where the oxide is of a less reactive metal than zinc, which cannot be satisfactorily reduced by carbon. A more reactive metal like aluminum can displace a less reactive metal from its metal oxide, resulting in the production of free metal. For instance, moderately reactive metals such as manganese and chromium are extracted by reducing their oxides with aluminum powder.
- (c) Aluminum powder reduces the metal oxide to metal and is itself oxidized to form aluminum oxide

Q.6. (a) Define corrosion.

(b) What is corrosion of iron called?

(c) How will you recognise the corrosion of silver?

(d) Why corrosion of iron is a serious problem?

(e) How can we prevent corrosion? [2014]

- Ans. (a) Corrosion is the process in which metals are gradually deteriorated by the action of air, moisture, or chemicals on their surface.
- (b) Rusting of iron metal is the most common form of corrosion.
- (c) When silver objects are exposed to air, they tarnish and gradually turn black due to the formation of a thin silver sulphide layer on their surface, caused by the action of hydrogen sulphide (H_2S) in the air.
- (d) Corrosion weakens iron and steel objects and structures, such as railings, car bodies, bridges, and ships, reducing their lifespan. Therefore, it is a significant issue.
- (e) **Methods to prevent corrosion:**
1. Galvanization is a method used to protect steel and iron from rusting.
 2. Painting, greasing, and oiling of metals are done to prevent corrosion.
 3. Cleaning metals regularly is also necessary.

CASE BASED QUESTIONS

Q.1. The melting points and boiling points of some ionic compounds are given below:

Compound	Melting Point (K)	Boiling Point (K)
NaCl	1074	1686
LiCl_2	887	1600
CaCl_2	1045	1900
CaO	2850	3120
MgCl_2	981	1685

These compounds are termed ionic because they are formed by the transfer of electrons from a metal to

a non-metal. The electron transfer in such compounds is controlled by the electronic configuration of the elements involved. Every element tends to attain a completely filled valence shell of its nearest noble or a stable octet.

[CBSE 2024]

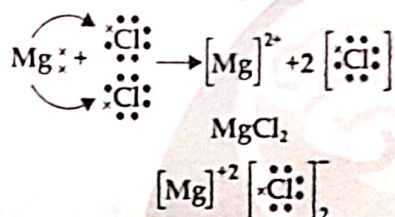
- (a) Show the electron transfer in the formation of magnesium chloride.
- (b) List two properties of ionic compounds other than their high melting and boiling points.

(c) Give reasons:

COMPETENCY

- (i) Why do ionic compounds in the solid state not conduct electricity?
- (ii) What happens at the cathode when electricity is passed through an aqueous solution of sodium chloride?

Ans. (a) Mg has two electrons in its outermost shell (atomic no. of Mg is 12, so electronic configuration is 2, 8, 2). Whereas Cl has seven electrons in its outermost shell (atomic no. of Cl is 17, so electronic configuration is 2, 8, 7)



- (b) (i) Ionic compound conducts electricity when dissolved in water or melted.
- (ii) Ionic compounds are usually soluble in water but insoluble in organic solvents like ether, acetone etc.
- (c) (i) Ionic compounds are made up of ions but they do not conduct electricity in their solid state because in the solid ionic compound, the ions are held together in fixed positions by strong electrostatic forces and cannot move freely.
- (ii) When electricity is passed through an aqueous solution of sodium chloride, sodium ions move towards cathode (which is a negatively charged electrode).

Q.2. On the basis of reactivity metals are grouped into three categories:

- (a) Metals of low reactivity
- (b) Metals of medium reactivity
- (c) Metals of high reactivity

Therefore, metals are extracted in pure form from their ores on the basis of

their chemical properties. Metals of high reactivity are extracted from their ores by electrolysis of the molten ore. Metals of low reactivity are extracted from their sulphide ores, which are converted into their oxides. The oxides of these metals are reduced to metals by simple heating. [CBSE 2023]



- (a) Name the process of reduction used for a metal that gives vigorous reaction with air and water both.
- (b) Carbon cannot be used as a reducing agent to obtain aluminium from its oxide. Why?
- (c) Describe briefly the method to obtain mercury from cinnabar. Write the chemical equation for the reactions involved in the process

Ans. (a) Electrolytic reduction. The Na (sodium) is a metal which has a very high affinity to oxygen. So reducing agent like carbon, aluminium cannot reduce oxygen from the oxide of sodium.

(b) Aluminium (Al) has more affinity to oxygen than carbon. Therefore, carbon cannot reduce aluminium oxide to aluminium.

(c) Mercury is a less reactive metal. Its oxide is easily reduced to metal only by simply heating. Cinnabar being a sulphide ore is first roasted in air to change it into its oxide compound. Mercury oxide (HgO) on further heating in air gets reduced to give Hg metal.

Q.3. One day, Mukesh was walking alongside the railway lines. Then he saw some workers doing work on the tracks. He got interested and wanted to take a closer look. As he got closer, he noticed that the workers were fully covered and wearing black glasses. He asked one worker what they were doing, and the worker replied that they were joining tracks. The worker cautioned him not to get any closer.

Answer the following questions:



(a) Which reaction is used for joining tracks?

COMPETENCY

(b) Why did the worker tell Mukesh not to get closer?

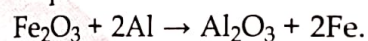
COMPETENCY

(c) Is the thermite reaction a displacement reaction? Write the balanced thermite reaction.

Ans. (a) The thermite reaction is used for joining tracks.

(b) The thermite reaction is highly exothermic, and the heat evolved in the reaction can harm Mukesh.

(c) Yes, the thermite reaction is a displacement reaction.



(DAY 6 SWAHA)

4

Electricity



What did CBSE ask last year?

MCQs & A/R	2 Questions ($2 \times 1 = 2$ Marks)
Subjective	No Very Short Questions asked
	1 Short Question ($1 \times 3 = 3$ Marks)
	No Long Questions Asked
Case Based	No Case Based Questions Asked

Note: All the above typology of questions include 'Competency based Questions' labelled as **COMPETENCY**.

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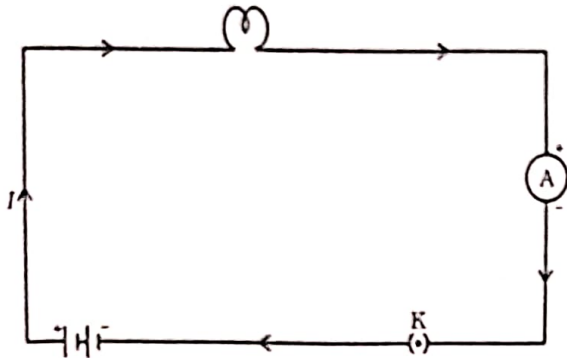


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App Store and
Web users



Electric Current & Circuit

- Questions revolve around the direction of charges and current in an electric circuit.



- (i) $q = it$
(ii) $V = Ri$

...where $\begin{cases} i = \text{current} \\ t = \text{time in flowing current} \\ V = \text{Voltage} \\ R = \text{Resistance,} \end{cases}$

Electric Potential & Potential difference

- Remember $W = VQ = VIt$ ($\because Q = it$)

...where $\begin{cases} V = \text{Voltage} \\ i = \text{Current} \\ t = \text{time} \end{cases}$

$$P = \frac{W}{t} = \frac{VIt}{t} = Vi$$

ELECT

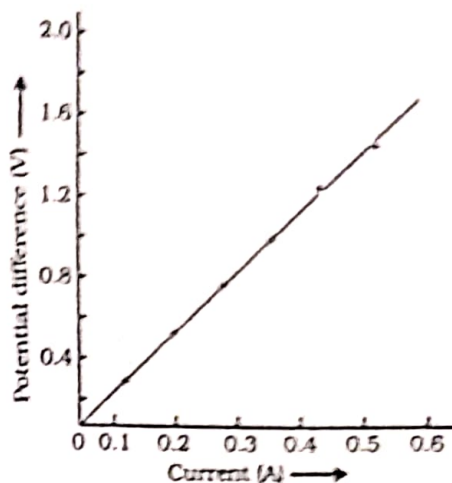
Circuit Diagram

- (MCQs may ask to identify the correct symbol, open or closed circuit)

Sl. No.	Components	Symbols
1.	An electric cell	$\text{---} \begin{array}{ c } \hline + \\ \hline \end{array} \text{---} \text{---} \begin{array}{ c } \hline - \\ \hline \end{array} \text{---}$
2.	A battery or a combination of cells	$\text{---} \begin{array}{ c } \hline + \\ \hline \end{array} \text{---} \text{---} \begin{array}{ c } \hline - \\ \hline \end{array} \text{---} \text{---} \begin{array}{ c } \hline + \\ \hline \end{array} \text{---} \text{---} \begin{array}{ c } \hline - \\ \hline \end{array} \text{---}$
3.	Plug key or switch (open)	$\text{---} () \text{---}$
4.	Plug key or switch (closed)	$\text{---} (\bullet) \text{---}$

Ohm's Law

- (CBSE's favourite topic for graph based questions)



Factors on which resistance of a conductor depends

- Short and long questions offer simple numericals from this topic).

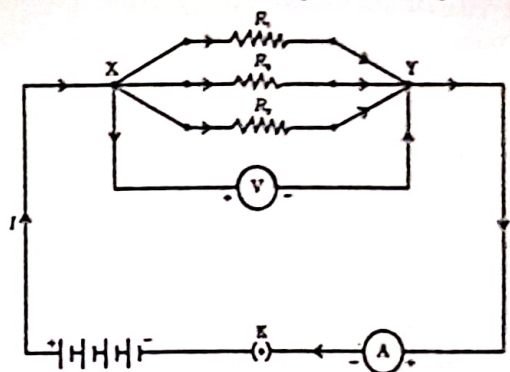
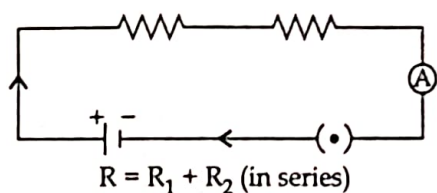
$$R = \rho \left(\frac{l}{A} \right)$$

...where ρ is the resistivity of the conductor
 l is length of the conductor
 A is area of the conductor

RICITY

Resistance of a system of resistors

- (Numericals come very frequently from this topic)



$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \quad (\text{in parallel series})$$

...where R = equivalent resistance
 R_1, R_2, R_3 are resistances in parallel series

Heating effects of electric current

- (Practical applications is questionable under short questions)

$$W = Vq = Ri^2t \quad (\because q = it)$$

Electric Power

- (Simple Formula based numericals asked from this topic)

$$P = Vi = i^2R \quad (\text{Note: Unit of power is watt})$$

OBJECTIVE QUESTIONS

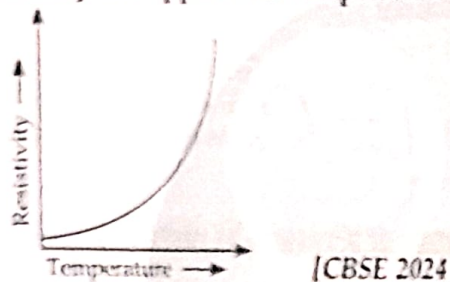
(DAY 7)

Multiple Choice Questions

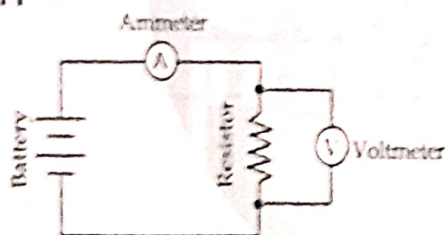
Q.1. Calculate the number of electrons constituting one coulomb of charge.

- (a) 6×10^{10} (b) 6×10^{-18}
(c) 6.25×10^{18} (d) 6×10

Q.2. The graph below shows the variation of resistivity of copper with temperature.



Kishore constructs a simple circuit as shown below. The resistor is made of copper.



He then heats the copper resistor. What will happen to the current flowing through the circuit? Why?

- (a) The current will increase because the resistance of copper increases with an increase in temperature.
(b) The current will increase because the resistance of copper decreases with an increase in temperature.
(c) The current will decrease because the resistance of copper increases with an increase in temperature.
(d) The current will decrease because the resistance of copper decreases with an increase in temperature.

Q.3. Priya has three resistors each of resistance $2\ \Omega$.

Which of the following resistances will she not be able to get by combining these resistors in different combinations?

- (a) $0.67\ \Omega$ (b) $0.75\ \Omega$
(c) $3\ \Omega$ (d) $6\ \Omega$

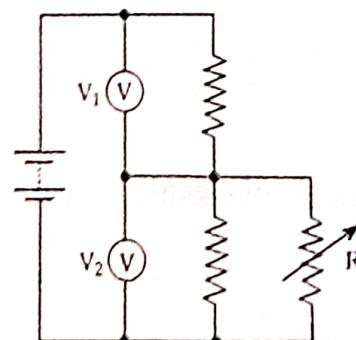
Q.4. A cylindrical copper wire X of length l and radius r has a resistance R and resistivity ρ . Another copper wire Y has a length $2l$ and a radius $2r$.

Which of the following rows in the table shows the correct resistance and resistivity of the copper wire Y?

	Resistance	Resistivity
I	$\frac{R}{2}$	ρ
II	R	ρ
III	$\frac{R}{2}$	$\frac{\rho}{2}$
IV	R	$\frac{\rho}{2}$

- (a) I (b) II
(c) III (d) IV

Q.5. The variable resistor R is connected in a circuit, as shown below. A variable resistor is one whose resistance can be changed.



The resistance of R is increased. What will happen to the voltmeter readings V_1 and V_2 ?

- (a) V_1 increases; V_2 increases
(b) V_1 increases; V_2 decreases

(c) V_1 decreases; V_2 increases

(d) V_1 decreases; V_2 decreases

Q.6. How is a voltmeter connected across the points between which the potential difference is to be measured?

COMPETENCY

(a) Series

(b) Depends on voltage

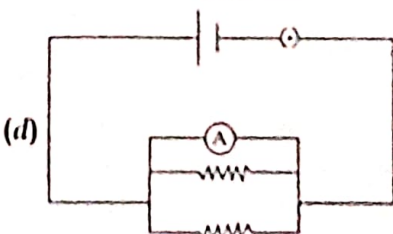
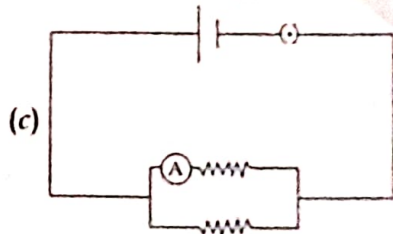
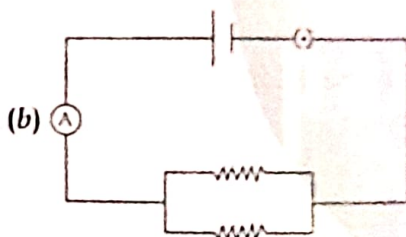
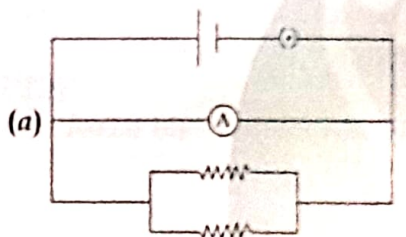
(c) Parallel

(d) None of these

Q.7. Kishore connects two resistors in parallel. He wants to measure the total current through the two resistors.

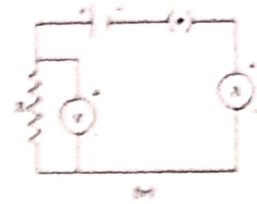
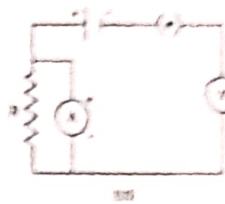
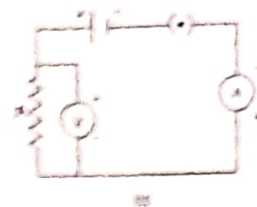
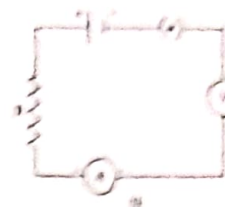
Which of the following shows the correct arrangement to measure the current through Ammeter 'A'?

[CBSE 2024]



Q.8. Identify the circuit in which the electrical components have been properly connected.

COMPETENCY



(a) (i)

(b) (ii)

(c) (iii)

(d) (iv)

Q.9. What is the symbol of rheostat?

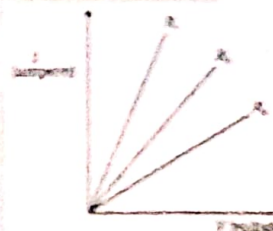
(a)

(b)

(c)

(d)

Q.10. A student carries out an experiment and plots the V-I graph of three samples of nichrome wire with resistances R_1 , R_2 and R_3 respectively. Which of the following is true?



COMPETENCY

(a) $R_1 = R_2 = R_3$

(b) $R_1 > R_2 > R_3$

(c) $R_1 > R_2 > R_3$

(d) $R_2 > R_3 > R_1$

Q.11. When a 12V battery is connected across an unknown resistor, there is a current of 25 mA in the circuit. Find the value of the resistor's resistance.

(a) $48 \times 10^3 \Omega$

(b) $48 \times 10^3 \Omega$

(c) $4.8 \times 10^3 \Omega$

(d) $408 \times 10^3 \Omega$

Q.12. Electrical resistivity of a given metallic wire depends upon [NCERT Exemplar]

(a) its length

(b) its thickness

(c) its shape

(d) nature of the material

- Q.13. A cylindrical conductor of length l and uniform area of cross-section A has resistance R . Another conductor of length $2l$ and resistance R of the same material has area of cross section.

COMPETENCY

- (a) $\frac{1}{2}$ (b) $\frac{3A}{2}$
(c) $2A$ (d) $3A$

- Q.14. The resistivity does not change if

[NCERT Exemplar]

- (a) the material is changed.
(b) the temperature is changed.
(c) the shape of the resistor is changed.
(d) both material and temperature are changed.

- Q.15. A copper wire has diameter 0.5 mm and resistivity of $1.6 \times 10^{-8} \text{ m}$. What will be the length of this wire to make its resistance 10Ω ? How much does the resistance change if the diameter is doubled.

- (a) 25Ω (b) $.25\Omega$
(c) 250Ω (d) 2.5Ω

- Q.16. What is the minimum resistance which can be made using five resistors each of $\frac{1}{5}\Omega$?

COMPETENCY

- (a) $\frac{1}{5}\Omega$ (b) $\frac{1}{25}\Omega$
(c) $\frac{1}{10}$ (d) 25Ω

- Q.17. What is the maximum resistance which can be made using five resistors each of $\frac{1}{5}\Omega$?

COMPETENCY

- (a) $\frac{1}{5}\Omega$ (b) 10Ω
(c) 5Ω (d) 1Ω

- Q.18. A piece of wire of resistance R is cut into five equal parts. These parts are then connected in parallel. If the equivalent resistance of this combination is R' , then the ratio $\frac{R}{R'}$ is

- (a) $\frac{1}{25}$ (b) $\frac{1}{5}$
(c) 5 (d) 25

- Q.19. How many 176Ω resistors (in parallel) are required to carry $5A$ on a $220V$ line?

[NCERT Exemplar]

- (a) 1 (b) 2 (c) 3 (d) 4

- Q.20. A battery of $9V$ is connected in series with resistors of 0.2Ω , 0.3Ω , 0.4Ω , 0.5Ω and 12Ω respectively. How much current will flow through the 12Ω resistor?

COMPETENCY

- (a) $67A$ (b) $6.7A$
(c) $.67A$ (d) 0

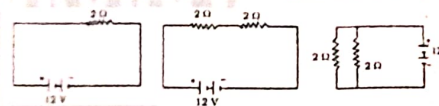
- Q.21. Two LED bulbs of $12W$ and $6W$ are connected in series. If the current through $12W$ bulb is $0.06A$ the current through $6W$ bulb will be:

[CBSE 2023]

- (a) $0.04A$ (b) $0.06A$
(c) $0.23A$ (d) 0

- Q.22. In the following circuits heat produced in the resistor or combination of resistors connected to a $12V$ battery will be _____

[NCERT exemplar]



- (a) same in all the cases
(b) minimum in case (i)
(c) maximum in case (ii)
(d) maximum in case (iii)

- Q.23. In an electrical circuit two resistors of 2Ω and 4Ω respectively are connected in series to a $6V$ battery. The heat dissipated by the 4Ω resistor in $5s$ will be

COMPETENCY

- (a) $5J$ (b) $10J$ (c) $20J$ (d) $30J$

- Q.24. Compute the heat generated while transferring 96000 coulomb of charge in one hour through a potential difference of $50V$

- (a) $4.8 \times 10^6 J$ (b) $0.48 \times 10^6 J$
(c) $48 \times 10^6 J$ (d) $4.8 \times 10^{69} J$

- Q.25. The resistance of a resistor is reduced to half of its initial value. If other parameters of the electrical circuit remain unaltered, the amount of heat produced in the resistor will become

[CBSE 2023]

- (a) fourth times (b) two times
(c) half (d) one fourth

- Q.26. Compare the power used in the 2Ω resistor in each of the following circuits: a $6V$ battery in series with 1Ω and 2Ω resistors

[NCERT exemplar]

- (a) $2W$ (b) $4W$
(c) $6W$ (d) $8W$

- Q.27. An electric kettle consumes $1kW$ of electric power when operated at $220V$. A fuse wire of what rating must be used for it?

COMPETENCY

- (a) $1A$ (b) $2A$
(c) $4A$ (d) $5A$

- Q.28. Unit of electric power may also be expressed as

- (a) volt ampere (b) kilowatt hour
(c) watt second (d) joule second

Assertion Reason Questions

Following questions consist of two statements: Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

- (a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, and R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

- Q.1. Assertion: The SI unit of electric current is ampere.

Reason: The unit of electric current is named after the French scientist André-Marie Ampère.

COMPETENCY

- Q.2. Assertion: In an electric circuit, current flows from the positive terminal to the negative terminal of a battery.

Reason: Conventionally, the direction of electric current is taken opposite to the direction of the flow of electrons.

Competency

Q.3. Assertion: The SI unit of potential difference is the volt.

Reason: The unit of potential difference is named after the Italian physicist Alessandro Volta.

Q.4. Assertion: Ohm's law states the relationship between potential difference and the current flowing in an electric circuit.

Reason: Resistance is the property of a conductor that resists the flow of charge through it.

Q.5. Assertion: In a series combination of resistors, the current is not the same through all the resistors present in the circuit.

Reason: The potential difference is also not same across all the resistors.

Q.6. Assertion: The heat produced in a resistor is directly proportional to the time for which the current flows through it.

Reason: The heat produced does not depend on the resistance of a resistor.

Competency

Q.7. Assertion: The heating effect of electric current is used to produce light in an electric bulb.

Reason: The filament of the bulb has a very high melting point.

Competency

Q.8. Assertion: Rate of doing work is power.

Reason: The SI unit of power is watt (W)

ANSWERS

Multiple Choice Answers

1. (c) $Q = n.e \Rightarrow 1 \text{ C} = n \times 1.6 \times 10^{-19}$

$$\therefore n = \frac{1}{1.6 \times 10^{-19}} = \frac{100}{16} \times 10^{18} \\ = 6.25 \times 10^{18}$$

FREE ADVICE: Remember the formula $Q = ne$. Where Q is charge, e is charge on one electron ($1.6 \times 10^{-19} \text{ C}$), and n is the number of electrons.

2. (c) 3. (b) 4. (a) 5. (c)
6. (b)

FREE ADVICE: Remember that voltmeter is always connected in parallel whereas ammeter is connected in series in a circuit.

7. (b) 8. (b) 9. (d)

10. (c) $R_3 = \frac{V}{I}$

$\therefore I$ is the lowest current

FREE ADVICE: R is directly proportional to V , hence $R_3 > R_2 > R_1$.

11. (c) **Formula used:** $V = I \times R$

12. (d)

FREE ADVICE: Remember the terms very well in this chapter, resistance depends on many factors like shape and length but resistivity depends only on the nature of the material used & temperature.

13. (c)

$$R = \rho \frac{l}{A} \quad \dots [\because R \propto \frac{l}{A}]$$

$$\text{So, } \frac{l_1}{A_1} = \frac{l_2}{A_2} \Rightarrow \frac{l}{A} = \frac{2l}{A_2} \Rightarrow A_2 = 2A$$

14. (c)

15. (d) **Formula used:** $R = \frac{\rho l}{A}$

$$\Rightarrow 10 = \frac{1.6 \times 10^{-8} l}{\pi (0.25 \times 10^{-3})^2}$$

$$l = \frac{\pi \times 10 \times (0.25 \times 10^{-3})^2}{1.6 \times 10^{-8}}$$

Again,

$$R = \rho \frac{l}{\pi r^2}$$

$$= \frac{1.6 \times 10^{-8} \times 10}{1.6 \times 10^{-8}} \times \frac{(0.25 \times 10^{-3})^2 \pi}{\pi (0.5 \times 10^{-3})^2}$$

$$= 10 \times \frac{1}{4} = 2.5 \Omega$$

16. (b)

Formula used: $R_{\min} = \frac{\text{ohm}}{\text{No. of resistors}}$

17. (d)

Formula used: $R_{\max} = \text{ohm} \times \text{no. of resistors}$

18. (b)

Let each cutting part be R^1

$$\frac{1}{R} = \frac{1}{R^1} + \frac{1}{R^1} + \frac{1}{R^1} + \frac{1}{R^1} + \frac{1}{R^1} = \frac{5}{R^1}$$

$$\Rightarrow \frac{1}{R} = \frac{5}{R^1} \quad \therefore \frac{R}{R^1} = \frac{1}{5}$$

19. (d)

Formula used: $nR = 176$

$$n \times \frac{220}{5} = 176 \quad \therefore n = 4$$

20. (c)

Formula used:

$$\begin{aligned} R &= R_1 + R_2 + R_3 + R_4 + R_5 \\ &= (0.2 + 0.3 + 0.4 + 0.5 + 12) \Omega \\ &= 13.4 \Omega \end{aligned}$$

$$\text{Now, } I = \frac{V}{R} = \frac{9}{13.4} = 0.67$$

21. (b) 22. (d)

23. (c)

Formula used: $I = \frac{V}{R}$

$$= \frac{6}{(2 + 4)} = \frac{6}{6} = 1 \text{ A}$$

$$\text{Heat} = I^2 R t = 1^2 \times 4 \times 5 = 20 \text{ J}$$

24. (a)

Formula used: $H = QV$

$$\begin{aligned} &= 96000 \times 50 \\ &= 4.8 \times 10^6 \text{ J} \end{aligned}$$

25. (b) $H_1 = \frac{V^2 t}{R} \quad \dots (i)$

and $H_2 = \frac{V^2 t}{R/2} = \frac{2Vt}{R} = 2H_1 \quad \text{From (i)}$

26. (d)

Formula used: $R_1 + R_2 = R_{eq}$

i.e., $i = \frac{V}{R} = \frac{6}{3} = 2 \text{ Amp.}$

$$P = Vi = i^2 R = 4 \times 2 = 8 \text{ W}$$

27. (d)

Formula used: $P = VI$

$$\Rightarrow I = \frac{P}{V} = \frac{1000}{220} = 4.545 \text{ or } 5 \text{ Amp}$$

28. (a)

Assertion-Reason Answers

1. (a) Both A and R are true, and R is the correct explanation of A.
2. (a) Both A and R are true, and R is the correct explanation of A.
3. (a) Both A and R are true, and R is the correct explanation of A.

4. (d) A is false but R is true.

5. (d) A is false but R is true.

6. (c) A is true but R is false.

Explanation: The heat produced in a resistor depends on multiple factors, including its resistance, but it is not solely determined by resistance. It also depends on the current and the duration for which the current flows through the resistor.

7. (a) Both A and R are true, and R is the correct explanation of A.

8. (b) Both A and R are true, and R is not the correct explanation of A.

SUBJECTIVE QUESTIONS

Very Short Answer Questions

Q.1. Define current. Give its S.I. unit.

[CBSE 2019, 2014]

Ans. The amount of net charge that flows through a circuit in a particular unit of time 't' is called current. The SI unit is Ampere (A).

Q.2 A charge of 150 coulomb flows through a wire in one minute. Find the electric current flowing through it.

Ans. We have, $Q = 150\text{C}$

$$t = 1 \text{ min} = 60\text{s}$$

$$\therefore I = \frac{Q}{t} = \frac{150}{60} = 2.5 \text{ Ampere}$$

Q.3. If the charge on an electron be $1.6 \times 10^{-19} \text{ C}$; find the approximate number of electrons in 1C. **COMPETENCY**

Ans. With the help of formula $q = ne$

$$\Rightarrow n = \frac{q}{e} \therefore n = \frac{1}{1.6 \times 10^{-19}} = 6.25 \times 10^{18}$$

Q.4. Before cleaning the light bulb in his room, Gautam turned off the light by turning the switch off. Yet, he received an electric shock while cleaning the bulb. **COMPETENCY**

Explain why the bulb connection was live though the switch was off.

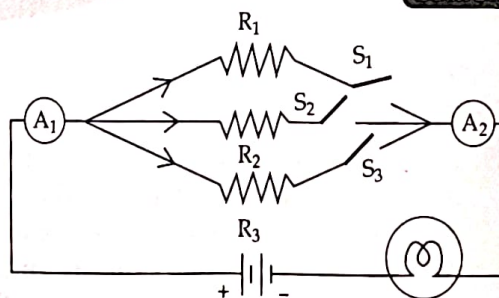
Ans. The switch was connected in the neutral wire instead of the live wire.

Q.5. What is meant by saying that the potential difference between the two points is '1 V'? **[CBSE 2013]**

Ans. If 1J of work has been done to move 1 C of charge between two points, then it is said that the potential difference between the two points is 1V.

Q.6. The circuit shown below has a bulb, three resistors R_1 , R_2 and R_3 , and three switches S_1 , S_2 and S_3 . There are also two ammeter A_1 and A_2 in the circuit.

COMPETENCY



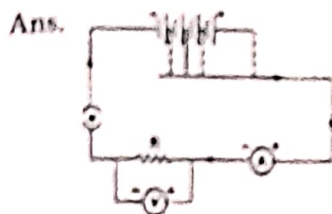
How will we compare the reading an ammeter A_2 with the reading an ammeter A_1 when

- (i) All the three switches are closed?
- (ii) One switch is closed?

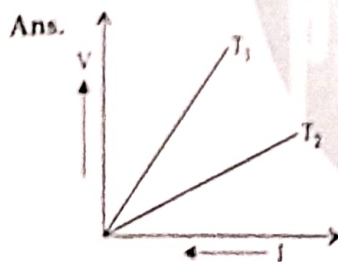
Ans. (i) The reading on ammeter A_2 will be the same as the reading on ammeter A_1 .

(ii) The reading on ammeter A_2 will be equal to the reading on ammeter A_1 .

Q.7. A child has drawn the electric circuit to study Ohm's law as shown in Fig. His teacher told that the circuit diagram needs correction. Study the circuit diagram and redraw it after making all corrections.



Q.8. The voltage-current ($V - I$) graph of a metallic conductor at two different temperatures T_1 and T_2 is shown below. At which temperature is the resistance higher? [CBSE 2011]



At T_1 temperature the resistance is higher because its slope is higher as $R \propto V$.

Q.9. Let the resistance of an electrical device remain constant, while the potential difference across its two ends decreases to one fourth of its initial value. What change will occur in the current through it? State the law which helps us in solving the above stated question? [CBSE 2023]

Ans. From ohm's law

$$\frac{V}{R} = I \quad \dots(i)$$

If R becomes constant and $V' = \frac{1}{4}V$

$$V' = IR'$$

$$\Rightarrow I' = \frac{V'}{R'} = \frac{1V}{4R}$$

From (i) and (ii), we get

$$I' = \frac{1}{4}I$$

Q.10. What is meant by the statement, "The resistance of a conductor is one ohm"? [COMPTON]

Ans. 1 ohm is the resistance of a conductor such that when a potential difference of 1 volt is applied to its ends, a current of 1 ampere flows through it.

Q.11. A voltmeter is to be connected in the circuit to measure potential difference across a conductor. Mention the type of combination in which it should be connected with the conductor.

[CBSE 2014]

Ans. Voltmeter is always connected in parallel across the conductor.

Q.12. How is an ammeter connected in a circuit to measure the current flowing through it? [CBSE 2011]

Ans. An ammeter is connected in series to measure the current flowing through it.

Q.13. Three resistors of 6Ω , 4Ω and 4Ω are connected together so that the total resistance is 8Ω . Draw a diagram to show this arrangement and give reason to justify your answer. [CBSE 2023]

Ans. We have, $\frac{1}{R'} = \frac{1}{R_2} + \frac{1}{R_3}$

$$\Rightarrow \frac{1}{R'} = \frac{1}{4} + \frac{1}{4} = \frac{1}{2} \quad \therefore R' = 2\Omega$$

Resultant resistance, $R = 6 + 2 = 8\Omega$

Q.14. 400J of heat is produced in 4 s in a 4 resistors. Find potential difference across the resistor. [CBSE 2011]

Ans. $H = 400J$, $T = 4s$, $R = 4$

$$\text{As we know, } H = \frac{V^2 t}{R}$$

$$\therefore V = \sqrt{\frac{RH}{t}} = \sqrt{4 \times \frac{400}{4}} = 20V$$

Q.15. State Joule's law of heating.

Ans. The law implies that heat produced in a resistor is:

- Directly proportional to the square of current for a given resistance,
- Directly proportional to resistance for a given current.
- Directly proportional to the time for which the current flows through the resistor.

Q.16. Power of a lamp is 60W. Find the energy in joules consumed by it in 1s.

[CBSE 2014]

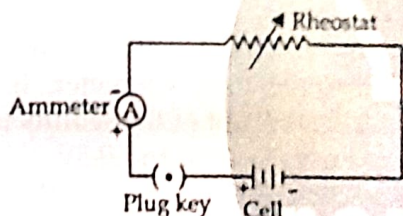
Ans. $P = 60W$

$t = 1s$

$$\therefore \text{Energy consumed} = P \times t \\ = 60 \times 1 = 60J$$

Q.17. Draw a labelled, schematic diagram of an electric circuit consisting a cell, plug key, rheostat and ammeter

Ans.



Q.18. What would you suggest to a student if while performing an experiment he finds that the pointer/needle of the ammeter and voltmeter do not coincide with the zero marks on the scales when circuit is extra ammeter/voltmeter is available in the laboratory. **COMPETENCY**

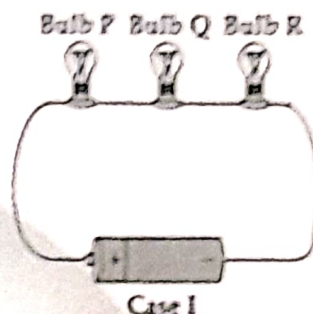
Ans. This is called the zero error of the scale of an ammeter or voltmeter. If there is a zero error, then this error is subtracted from the value that is indicated when the circuit is closed; otherwise, the accurate current or potential difference will not be recorded.

(DAY 8)

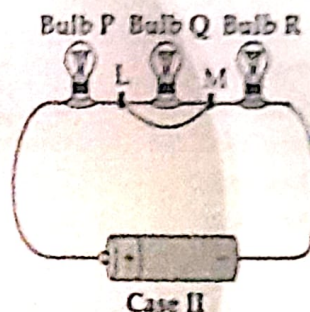
Short Answer Questions

Q.1. (a) Vijaya connects three bulbs P, Q and R in series with a battery in

two different ways using identical conducting wires as shown below. She notices that in Case I all three bulbs glow but in Case II only the bulbs P and R continue to glow. What could be the reason for the bulb Q to not glow in Case II? Explain.



Case I



Case II

(b) Two resistances when connected in parallel give a combined resistance of $3/10 \Omega$.

When the same two resistors are connected in series, the combined resistance becomes 15Ω .

Calculate the individual resistance of each resistor.

Ans. (a) The current will flow through the additional wire that connects the points L and M (avoiding the bulb) as it offers a path of least/lower resistance as compared with the bulb.

$$(b) \frac{3}{10} = \frac{1}{R_1} + \frac{1}{R_2} \quad \dots(i)$$

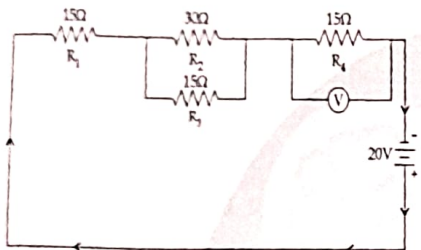
$$R_1 + R_2 = 15 \Rightarrow R_1 = 15 - R_2 \quad \dots(ii)$$

$$\Rightarrow \frac{3}{10} = \frac{R_1 + R_2}{R_1 R_2}$$

$$\Rightarrow \frac{3}{10} = \frac{15}{(15 - R_2) \cdot R_2}$$

$$\begin{aligned}
 &\Rightarrow 15R_2 - R_2^2 = 50 \\
 &\Rightarrow R_2^2 - 15R_2 = -50 \\
 &\Rightarrow R_2^2 - 15R_2 + 50 = 0 \\
 &\Rightarrow R_2^2 - 10R_2 - 5R_2 + 50 = 0 \\
 &\Rightarrow R_2(R_2 - 10) - 5(R_2 - 10) = 0 \\
 &\Rightarrow R_2 - 5 = 0 \text{ or } R_2 - 10 = 0 \\
 &\therefore R_2 = 10 \text{ ohm, } R_1 = 5 \text{ ohm} \\
 &\text{or } R_1 = 10 \text{ ohm, } R_2 = 5 \text{ ohm}
 \end{aligned}$$

Q.2. Four resistors, a voltmeter and a battery are connected in a circuit as shown below.



- What is the net resistance in the circuit?
- How much potential difference will the voltmeter connected across the resistor R_4 measure?

Or

What is the power dissipated by the resistor R_1 ?

- If R_3 is removed, will the net current in the circuit increase or decrease or remain the same? Justify your answer.

Ans. (a) The net resistance,

$$\begin{aligned}
 R &= R_1 + \left(\frac{R_2 R_3}{R_2 + R_3} \right) + R_4 \\
 &\quad \dots \left[\because R_{eq} = \frac{R_2 R_3}{R_2 + R_3} \right] \\
 &= 15 + \left(\frac{30 \times 15}{30 + 15} \right) + 15 \\
 &= 15 + \frac{30 \times 15}{45} + 15 \\
 &= 15 + 10 + 15 = 40 \Omega
 \end{aligned}$$

- Voltage drop across R_4
= Net current $\times R_4$

$$\text{Net current} = \frac{V}{R} = \frac{20}{40} = 0.5 \text{ A}$$

$$\begin{aligned}
 \text{Voltage drop across } R_4 \\
 &= 0.5 \times 15 = 7.5 \text{ V}
 \end{aligned}$$

Or, Power dissipated by the resistor is given by:

$$\begin{aligned}
 P &= I^2 R_1 = (0.5)^2 \times 15 = 0.25 \times 15 \\
 &= 3.75 \text{ watt.}
 \end{aligned}$$

Therefore, $P = 3.75 \text{ watt.}$

$$i = \frac{V}{R_1 + R_2 + R_3} = \frac{20}{15 + 30 + 15} = \frac{20}{60} = \frac{1}{3}$$

$$\therefore i = 0.33 \text{ A}$$

- net current will decrease
 - because R_3 is connected in parallel and removing it will increase the net resistance in the circuit thereby reducing the net current.

- What is the least count of voltmeter?
- In a voltmeter there are 20 divisions between the '0' mark and '0.5' V mark. Calculate its least count.

COMPETENCY [2017]

Ans. (a) The minimum potential difference between two given terminals, measured by a voltmeter, is called the least count of that voltmeter.

- Given marks = 0 and 0.5V

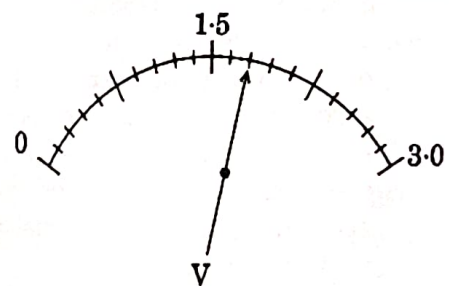
$$\text{Potential difference} = 0 - 0.5 \text{ V}$$

$$\text{Number of division between given two marks} = 20$$

$$\text{Hence, } \frac{0.5}{20} = 0.025 \text{ volts is least count}$$

- Consider the scale of voltmeter shown in the diagram and answer the following questions:

COMPETENCY



- What is the least count of the voltmeter?
- What is the reading shown by the voltmeter?
- If the voltmeter is connected across a resistor of 20Ω , how much current is flowing through the resistor?

Ans. (a) Given maximum value = 3.0
 Least count of voltmeter = $\frac{3}{20}$
 = 0.15V

$$\text{Least Count} = \frac{\text{Potential difference}}{\text{No. of divisions/units}}$$

(b) Show given reading = $1.5 + 0.15 + 0.15$
 = 1.8V

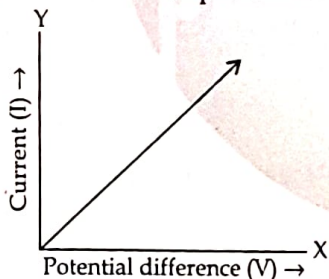
(c) $R = 20$; $V = 1.8$
 By ohm law, $V = IR$
 $\therefore I = \frac{1.8}{20} = 0.09\text{A}$

Q.5. (a) State the relation correlating the electric current flowing in a conductor and the voltage applied across it. Also draw a graph to show this relationship.

(b) Find the resistance of a conductor if the electric current flowing through it is 0.35A, when the potential difference across it is 1.4V.

COMPETENCY

Ans. (a) The current flowing through a conductor is directly proportional to the potential difference across its ends, at constant temperature.



$$I \propto V$$

$$R = \frac{V}{I}$$

Ohm's law states the relationship between current and voltage.

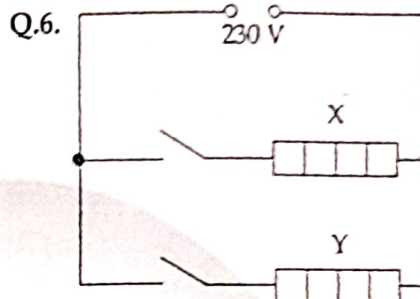
The graph between current (I) and potential difference (V) is shown by a straight line passing through the origin.

Hence, the straight line on the graph shows that current is directly proportional to the potential difference.

(b) $I = 0.35\text{A}$
 $V = 1.4\text{V}$
 By ohm's law
 $V = IR$

$$\Rightarrow R = \frac{V}{I}$$

$$\therefore R = 14 \times \frac{100}{10 \times 35} = 14 \times \frac{10}{35} = 4 \Omega$$



I. The electric circuit (given figure) in a clothes dryer contains two heaters X and Y in parallel. The figure shows the circuit connected to a 230 V power supply. When both switches are closed, the current in X is 3.5 A. Analyse the given circuit and answer the following questions.

(i) Calculate the power developed in heater X.

(ii) If the resistance of X is double that of Y, calculate the current in heater Y.

II. The given figure shows two resistors X and Y connected in series to a battery. The power dissipated for this combination is P_1 . When these resistors are connected in parallel to the same battery then the power dissipated is given by P_2 . Find out the ratio $\frac{P_1}{P_2}$. [CBSE 2024]

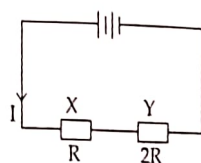
Ans. I. (i) Given. $V = 230\text{ V}$; $I = 3.5\text{ A}$

$$\text{As we know, } P = VI = 230 \times 3.5 = 805\text{ W}$$

(ii) $I \propto \frac{1}{R}$, so half the resistance means double the current.

$$\text{Therefore, current in Y} = 3.5 \times 2 = 7.0\text{ A.}$$

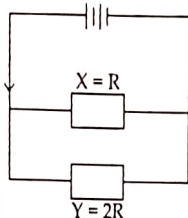
II.



In Series

Resultant Resistance,

$$\begin{aligned} R_1 &= X + Y \\ &= R + 2R = 3R \\ \therefore P_1 &= \frac{V^2}{R_1} = \frac{V^2}{3R} \dots (i) \end{aligned}$$



In Parallel Combination

Resultant Resistance R_2 ,

$$\begin{aligned} \frac{1}{R_2} &= \frac{1}{X} + \frac{1}{Y} \\ \Rightarrow \frac{1}{R_2} &= \frac{1}{R} + \frac{1}{2R} \\ &= \frac{2+1}{2R} \\ \Rightarrow \frac{1}{R_2} &= \frac{3}{2R} \\ \Rightarrow R_2 &= \frac{2R}{3} \\ \therefore P_2 &= \frac{V^2}{R_2} = \frac{V^2}{2R/3} \\ &= \frac{3V^2}{2R} \dots (ii) \end{aligned}$$

$$\begin{aligned} \therefore \text{Ratio} &= \frac{P_1}{P_2} = \frac{\frac{V^2}{3R}}{\frac{3V^2}{2R}} \\ &= \frac{V^2}{3R} \times \frac{2R}{3V^2} \\ &= \frac{2}{9} \dots [\text{From (i) \& (ii)}] \end{aligned}$$

Q.7. A metallic wire of 625 mm length offers a 4Ω resistance. If the resistivity of the metal is 4.8×10^{-7} ohm-metre then calculate the area of cross-section of the wire. [CBSE 2014]

Ans. Given: $p = 4.8 \times 10^{-7} \Omega\text{m}$

$$R = 4\Omega$$

$$l = 625\text{mm} = 0.625\text{m}$$

$$\text{Resistivity, } \rho = R \times \frac{A}{l}$$

$$\therefore A = \rho \left(\frac{l}{R} \right)$$

$$= 4.8 \times 10^{-7} \times \frac{0.625}{4} = 7.5 \times 10^{-8} \text{m}^2$$

Q.8. The resistance of a wire of 0.01 cm radius is 10Ω . If the resistivity of the material of the wire is 50×10^{-8} ohm meter, find the length of the wire. [CBSE 2014]

Ans. Radius = $0.01 \text{ cm} = 0.01 \times 10^{-2} \text{ m}$

$$\text{Resistivity} = 50 \times 10^{-8} \text{ ohm meter}$$

$$\text{Resistance} = 10\Omega$$

$$\text{Areas of cross-section, } A = \pi r^2$$

$$= 3.14 \times (0.01 \times 10^{-2})^2 \text{ m}^2$$

$$= 3.14 \times 10^{-8} \text{ m}^2$$

$$S = R \times \frac{A}{l}$$

$$\Rightarrow L = R \times \frac{A}{S}$$

$$\therefore L = \frac{10 \times 3.14 \times 10^{-8}}{50 \times 10^{-8}} = \frac{3.14}{5} \text{ m} = 0.628 \text{ m}$$

Q.9. Compute the heat generated while transferring 96,000 coulomb of charge in two hours through a potential difference of 40V [CBSE 2020]

Ans. Potential difference = 40V

$$\text{Time} = 2 \text{ hours, Charge} = 96,000\text{C}$$

$$\text{Formula: } I = \frac{Q}{t}$$

$$I = \frac{96,000}{2 \times 60 \times 60} = 13.33 \text{ A}$$

$$\text{By ohm's law } R = \frac{V}{I}$$

$$R = \frac{40}{13.33} \Rightarrow R = 3\Omega$$

\therefore Heat produced,

$$H = I^2 \times R \times t = (13.33)^2 \times 3 \times 2 \times 60 \times 60$$

$$= 3838080.24 \text{ J} = 3838.080 \text{ kJ}$$

Practical examples: Electric bulb and electric fuse.

Q.10. (a) Derive an expression for Joule's law of heating.

(b) Give two examples for applications of heating effect of electric current.

(c) 200 J of heat is produced each second in a 8 resistor. Find the potential difference across the resistor.

[CBSE 2014]

Ans. (a) The amount of work done to move charges across the potential difference

$$W = V \times Q$$

Also,

$$I = \frac{Q}{t}$$

$$\Rightarrow Q = I \times t$$

From ohm law

$$V = I \times R$$

$$W = I \times t \times I \times R$$

$$W = I^2 R t$$

Also written as $H = I^2 R t$

(b) (i) electric bulb

(ii) electric fuse

(c) We have, $H = 200J$

$$R = 8$$

$$t = 1 \text{ sec}$$

As we know, $H = I^2 R t$

$$I^2 = \frac{H}{R t}$$

$$\Rightarrow I = \sqrt{\frac{H}{R t}} = \sqrt{\frac{200}{8 \times 1}}$$

$$= \sqrt{\frac{200}{8}} = 5 \text{ ampere}$$

$$\text{Now, } V = IR \Rightarrow V = 5 \times 8$$

$$\therefore V = 40 \text{ volt}$$

Q.11. Two lamps, one rated 40W at 220V and the other 100 W at 220V, are connected in parallel to the electric supply at 220V.

(a) Calculate the current drawn from the electric supply.

(b) Calculate the total energy consumed by the two lamps together when they operate for one hour.

COMPETENCY

Ans. (a) $P_1 = 40$

$$V_1 = 200V$$

$$\therefore I_1 = \frac{P_1}{V_1}$$

$$= \frac{40}{220} = \frac{2}{11} \text{ ampere}$$

$$P_2 = 100W$$

$$V_2 = 200V$$

$$\therefore I_2 = \frac{P_2}{V_2}$$

$$= \frac{100}{220} = \frac{5}{11} \text{ ampere}$$

Now, Total current draw $I = I_1 + I_2$

$$= \frac{2}{11} + \frac{5}{11} = \frac{7}{11} \text{ ampere.}$$

(b) $E_1 = P_1 \times t$

$$E_1 = 40 \times 1 = 40Wh$$

$$E_2 = P_2 \times t$$

$$E_2 = 100 \times 1 = 100Wh$$

Total energy consumed

$$= 40Wh + 100Wh = \frac{140}{1000} kWh$$

$$= 0.14kWh$$

(DAY 9)

Long Answer Questions

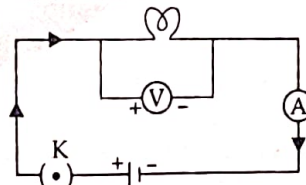
Q.1. When a high resistance voltmeter is connected directly across an electric bulb, its reading is 2V. An electric cell is sending the current of 0.4 ampere (measured by an ammeter) in the electric circuit.

(a) Draw the circuit.

(b) Find the resistance of the electric bulb.

(c) If graph is plotted between V and I, show the nature of the graph obtained. [CBSE 2014]

Ans. (a)



(b) $I = 0.4A,$

$$V = 2V$$

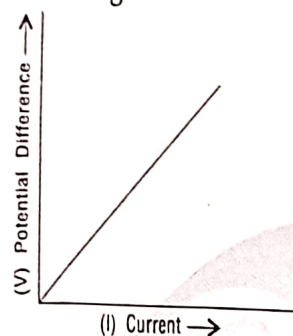
$$V = IR$$

$$\therefore R = \frac{V}{I} = \frac{2}{0.4} = 5\Omega$$

(c) The V-I graph will be in a straight line that passes through the origin of the graph.

Q.2. (a) A current of 10 A flows through a conductor for two minutes.

- (i) Calculate the amount of charge passing through the conductor.
(ii) If the charge of an electron is $1.6 \times 10^{-19} \text{ C}$, then calculate the total number of electrons flowing through the conductor.
(b) V-I graph for a conductor is as shown in the figure:



What do you infer from this graph?

Ans. (a) Given, $I = 10 \text{ A}$,

$$t = 2 \text{ min} = 2 \times 60 \text{ s} = 120 \text{ s}$$

$$(i) Q = I \times t$$

$$\therefore Q = 1200 \text{ C}$$

$$(ii) Q = ne$$

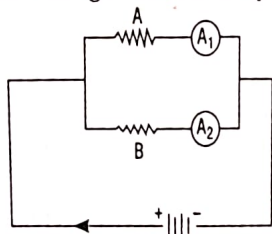
$$\Rightarrow 1200 = n \times 1.6 \times 10^{-19} \text{ C}$$

$$\Rightarrow n = \frac{1200}{1.6 \times 10^{-19}}$$

$$= 7.5 \times 10^{21} \text{ electrons}$$

(b) As graph is a straight line, so it is clear from the graph that $V \propto I$. Hence, the resistance of the conductor is constant.

Q.3. Rahima was investigating a circuit for her school project. She wanted to demonstrate the effect of length on the resistance of a conductor. The following is the given circuit with resistors A and B that are made of the same metal and the same thickness but A is twice as long as B. The total current in the circuit is 6 A and the Voltage of the battery is 12 V.



- (a) What will be the resistance in the circuit?
(b) Determine the value of 'RA' and 'RB'.
(c) Determine the current in both the ammeters. Will the current in 'A1' and 'A2' be the same? Justify your answer.

Or, (c) Define resistivity. What are the factors affecting the resistivity of a conductor? [CBSE 2021]

$$\text{Ans. (a)} R = \frac{V}{I} = \frac{12}{6} = 2 \Omega$$

$$(b) R_A = \frac{12}{2} = 6 \Omega$$

$$R_B = \frac{12}{4} = 3 \Omega$$

(c) For the given circuit, $R \propto l$ and $R \propto \frac{1}{l}$

The resistance of 'A' is twice that of 'B' and so the current in both will not be the same but in the ratio of 1:2, so the current in 'A' will be 2A and that in 'B' will be 4A.

$$\therefore I_A = \frac{V}{R_A} = \frac{12}{6} = 2 \text{ A}$$

$$I_B = \frac{V}{R_B} = \frac{12}{3} = 4 \text{ A}$$

Or, (c) Resistivity is defined as the electrical resistance of a conductor of unit cross-sectional area and unit length. It is the characteristic property of the material and depends on the nature of the material.

Q.4. A piece of wire is redrawn, without change in volume so that its radius is halved. Compare the new resistance with the original resistance. [CBSE 2015]

Ans. Length of original wire = l

Radius = r

$$R = \rho \left(\frac{l}{\pi r^2} \right)$$

Original volume,

$$V_1 = \pi r^2 l$$

When its radius get halved it becomes

$$\frac{r}{2} \text{ and length} = l'$$

$$R' = \frac{\rho l'}{\pi \left(\frac{r}{2}\right)^2}$$

$$V_2 = \pi \left(\frac{r}{2}\right)^2 l'$$

Volume will be same,

$$V_1 = V_2$$

$$\pi r^2 l = \pi \left(\frac{r}{2}\right)^2 l'$$

$$l' = 4l$$

$$\text{Substituting } l' = 4l \text{ in } R' = \frac{\rho l'}{\pi \left(\frac{r}{2}\right)^2}$$

$$R' = \rho \cdot 4l \times \frac{4}{\pi r^2} = \rho l \times \frac{16}{\pi r^2} = 16R$$

Hence, resistance is increased by 16 times.

- Q.5. (a) What is meant by resistance of a conductor? Define its SI unit.
 (b) List two factors on which the resistance of a rectangular conductor depends.
 (c) How will the resistance of a wire be affected if its (i) length is doubled, and (ii) radius is also doubled? Give justification for your answer.

[CBSE 2023]

- Ans. (a) Resistance is the property of a conductor to resist the flow of charges through it and SI unit of resistance is ohm it is defined as If the potential difference across the two ends of a conductor is 1 V and the current through it is 1A, then the resistance R. of the conductor is 1Ω
 (b) The two factors on which the resistance of a rectangular conductor depends is:
 (i) the resistance is directly proportional to the length of the conductor.
 (ii) the resistance is inversely proportional to the area of cross-section of the conductor

$$(c) (i) \text{ Resistance } R = \frac{\rho l}{A}$$

If the length doubles $l' = 2l$

$$R' = \frac{\rho l'}{A} = \frac{2\rho l}{A} = 2R$$

Therefore if length of the given conductor is doubled, the resistance will also get doubled.

$$(ii) \text{ If radius get doubled, } A = \pi R^2$$

$$A' = \pi R'^2 \text{ and } R' = 2R$$

$$A' = \pi (2R)^2 = 4\pi R^2$$

$$A' = 4A$$

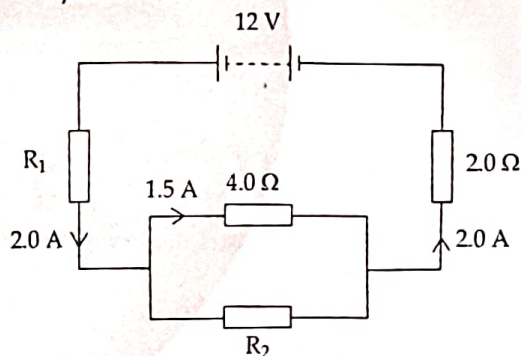
$$\text{Now, } R' = \frac{\rho l}{A'}$$

$$R' = \frac{\rho l}{4A}$$

$$\therefore R' = \frac{1}{4} \times \frac{\rho l}{A} = \frac{1}{4} R$$

Therefore, if radius of the conductor is doubled the resistance becomes 1/4th.

Q.6.

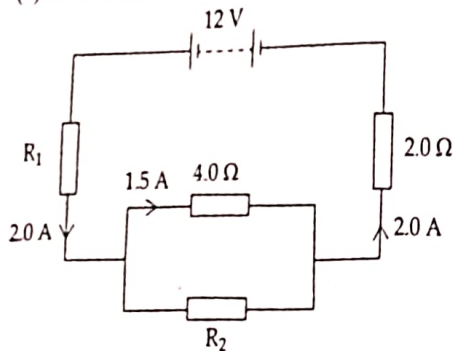


The given circuit is a part of an electrical device. Use the information given in the question to calculate the following:

- (i) Potential Difference across R_2 .
 (ii) Value of the resistance R_2 .
 (iii) Value of resistance R_1 .

Ans. (i) Potential difference Across R_2
 = Potential difference Across 4 Ω resistor
 ...[Both are in parallel]
 = $1.5A \times 4 \Omega = 6V$

(ii) Given. $R_2 = 2.0 \Omega$



Current through $4 \Omega = 1.5 \text{ A}$

Hence current through $R_2 = 2 - 1.5 = 0.5 \text{ A}$

Using Ohm's law for R_2 , we get $I = \frac{V}{R}$

$$\Rightarrow V = I \times R$$

$$\Rightarrow 6\text{V} = 0.5 \text{ A} \times R_2$$

$$\therefore R_2 = \frac{6}{0.5} = 12 \Omega$$

(iii) Potential difference Across R_1

= Total Potential difference - (Potential difference across R_2)

- (Potential difference across 2.0Ω)

\Rightarrow Potential difference Across 2.0Ω

$$= 2 \times 2 = 4 \text{ V}$$

and Potential difference Across $R_2 = 6\text{V}$

...[From Point (i)]

Hence, Potential difference across

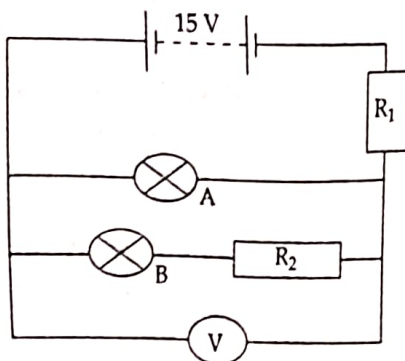
$$R_1 = 12 - 6 - 4 = 2\text{V}$$

Current through $R_1 = 2\text{A}$

Using Ohm's Law, we get

$$R_1 = \frac{V}{I_1} = \frac{2\text{V}}{2\text{A}} = 1 \Omega$$

Q.7.



As shown in the given figure A and B are two lamps. Lamp A is rated at 12

V, 24W. Lamp B is rated at 6.0 V. When lamp B operates at its rated voltage, the current in it is 3.0 A. The values of R_1 and R_2 are chosen so that both lamps operate at their rated voltages.

Based on the information given, answer the following:

(i) Calculate the current in Lamp A.

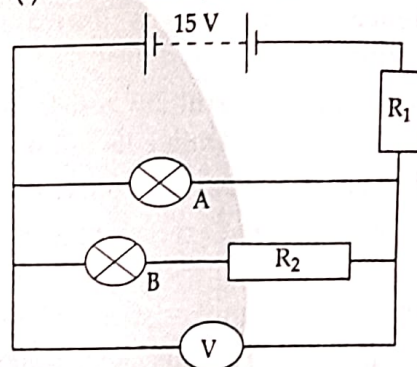
(ii) State and give reason for the reading of the Voltmeter.

(iii) Calculate the resistance of R_2 .

(iv) Find the value of the resistance R_1 .

[CBSE 2024]

Ans. (i) As we know, $P = IV$



$$\Rightarrow I = \frac{P}{V} = \frac{24}{12} = 2\text{A}$$

Current in lamp A = 2A

(ii) As Lamp A and Lamp B both are in parallel.

Therefore, potential difference across the arm containing A = potential difference across arm containing B = 12 V.

(iii) Potential difference Across R_2 + potential difference across B = 12 V.

Potential difference Across B = 6V (given)

$$\therefore \text{Potential difference Across } R_2 = 12\text{V} - 6\text{V} = 6\text{V}$$

Current through R_2

= Current through

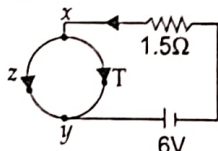
B = 3A (given)

$$\therefore R_2 = \frac{V}{I} = \frac{6\text{V}}{3\text{A}} = 2 \Omega$$

- (iv) Current through R_1
 $= \text{Total Current} = 3\text{A} + 2\text{A} = 5\text{A}$
 Potential difference across
 $R_1 = 15\text{V} - 12\text{V} = 3\text{V}$
 $\therefore R_1 = \frac{3\text{V}}{5\text{A}} = 0.6\ \Omega$

Q.8. (a) Explain how does a cell maintain current in a circuit.

- (b) In the circuit given here the resistance of the path $xTy = 2\pi$ and that of $xzy = 60\pi$.



- (i) Find the equivalent resistance between x and y .
 (ii) Find the current in the main circuit.
 (c) Calculate the current that flows through the path xTy and xzy .

[CBSE 2014]

Ans. (a) Inside the cell, chemical reactions are taking place, resulting in the generation of a potential difference across the terminals of the cell, which sets and maintains the current in the circuit.

(b) (i) $\frac{1}{R_e} = \frac{1}{2} + \frac{1}{6} = \frac{4}{6} = \frac{2}{3}$

$\Rightarrow R_e = 1.5\Omega$

(ii) Total resistance $= R_e + 1.5\Omega$
 $= 1.5\Omega + 1.5\Omega = 3\Omega$

$\therefore I = \frac{V}{R} = \frac{6}{3} = 2\text{A}$

- (c) Potential difference between the parallel combination of 2Ω and 6Ω
 $= 1.5 \times 2 = 3\text{V}$

Now, $i_{xTy} = \frac{3}{R_{xTy}} = \frac{3}{2} = 1.5\text{A}$

$\therefore i_{xzy} = \frac{3}{R_{xzy}} = \frac{3}{6} = 0.5\text{A}$

Q.9. (a) An electric bulb is rated at 200 V; 100 W. What is its resistance?

- (b) Calculate the energy consumed by 3 such bulbs if they glow continuously for 10 hours for the complete month of November.

- (c) Calculate the total cost if the rate is 16.50 per unit.

COMPETENCY

Ans. (a) Potential difference of electric bulb
 $= 200\text{V}$

$P = 100\text{W}$

$P = VI$

$I = \frac{P}{V} = \frac{100}{200} = 0.5\text{A}$

Now $V = IR$

$\therefore R = \frac{V}{I} = \frac{200}{0.5} = 400\Omega$

- (b) Power $= 200 \times 0.5 = 100\text{ Wh}$

$\frac{100}{1000}\text{kWh} = \frac{1}{10}\text{kWh}$

Number of bulbs $= 3$

Time $= 10\text{ hr.} \times 30\text{ days} = 300\text{ hours}$

$\therefore \text{Energy consumed} = P \times t = \frac{3 \times 300}{10}$

$= 90\text{kWh}$

$= 90\text{ electrical units}$

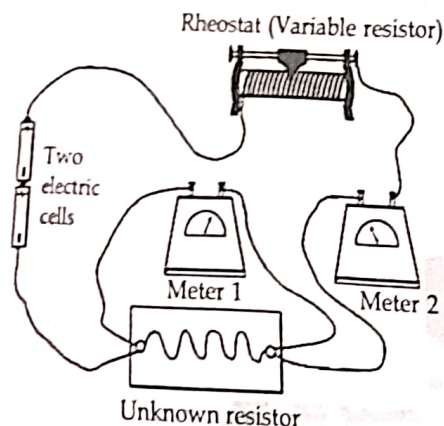
- (c) Cost of 1 unit $= 6.50\text{ rupees}$

Hence, cost of 90 units $= 90 \times 6.50$

$= 585\text{ rupees}$

CASE BASED QUESTIONS

Q.1. The diagram below shows how Amita had connected a circuit to verify Ohm's law. This set up was done to understand the resistance and Ohm's law.

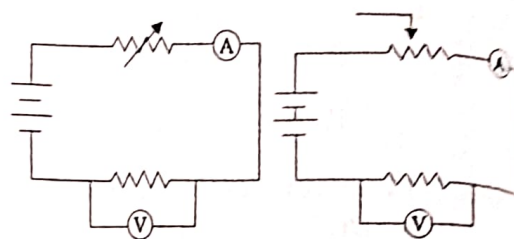


Answer the following questions

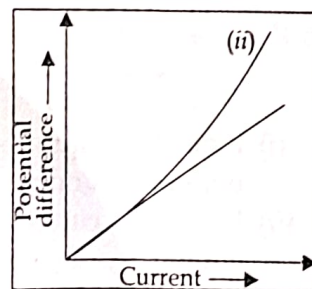
- Identify which of the devices in the circuit is an ammeter. Justify your answer.
- Draw a circuit diagram with appropriate symbols for the circuit shown in the diagram above.
- Amita forgot to put a switch in the circuit. During the experiment, the wire labelled "Unknown resistor" became hot. The resistivity of the material of the wire increases with temperature. Draw two potential difference vs current graphs (in the same diagram): (i) as expected by Amita, (ii) as based on actual observation she would make.

COMPETENCY

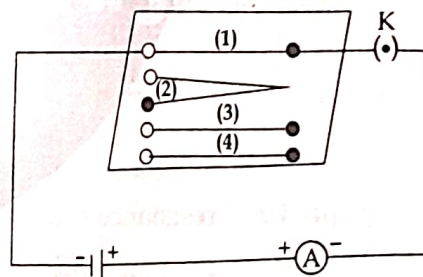
- Ans. (a) Meter 2 because it is connected in series with the unknown resistor through which the current needs to be measured.
- (b) Correct connections for the cell, the unknown resistor and the rheostat in the diagram:
- Correct connections for the two meters in the diagram.
 - Use of correct symbols for all components.



- (i) straight line passing through origin.
- (ii) curved line with an increasing slope.



Q.2. Mohit made an electric circuit consisting of a cell, an ammeter, a nichrome wire of length l say, marked (1) and a plug key, as shown in the figure below. This setup was made to understand the factor that effect resistance of the conductor.



- If Mohit replaces the nichrome wire with another nichrome wire of the same thickness but twice the length (2l), what will be the reading of the ammeter?
- Mohit again replaced the wire with a thicker nichrome wire of the same length. A thicker wire has a larger cross-sectional area. What will be the ammeter reading now?

COMPETENCY

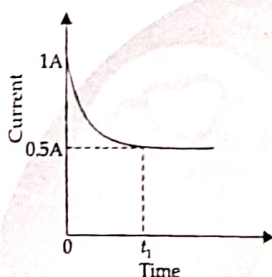
COMPETENCY

- (c) From the above two questions, which factors affect the resistance?

Ans. (a) The ammeter reading will decrease to one-half (0.5) A.
 (b) The reading of the ammeter increases by double.
 (c) The factors that affect the resistance are length and area of cross-section.

Q.3. An incandescent bulb works on the heating effect of electric current. When a current passes through the filament of a bulb it heats the filament to a high temperature which causes the filament to glow.

The graph shows the variation in the current through a bulb immediately after it is switched on. The current decreases from 1A at time $t = 0$ to 0.5A at $t = t_1$. The voltage of the power supply is 200V and remains constant throughout.



- (a) Based on the graph, state how the resistance of the bulb filament changes as the temperature increases from time $t = 0$ to $t = t_1$.
 (b) Name the elements which is used as filament in an incandescent bulb?

COMPETENCY

- (c) What is the power consumed by the bulb when it is glowing at its full brightness?

COMPETENCY

Ans. (a) The resistance of the bulb increases as the temperature increases.
 (b) Tungsten and argon and nitrogen gases are used to prolong the life of filament.
 (c) The current when the bulb is glowing at its full brightness = 0.5 A
 Power = $V \times I = 200 \times 0.5 = 100W$

(DAY 9 SWAHA)



Available On
amazon



5

Magnetic Effects of Electric Current



What did CBSE ask last year?

MCQs & A/R	1 Question ($1 \times 1 = 1$ Mark)
Subjective	—
	1 Short Question ($1 \times 3 = 3$ Marks)
	—
Case Based	1 Question ($1 + 1 + 2 = 2$ Marks)

Note: All the above typology of questions include 'Competency based Questions' labelled as **COMPETENCY**.

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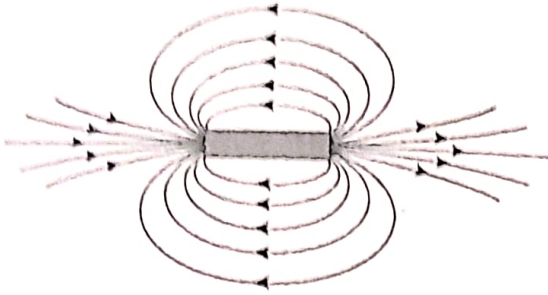


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App Store and
Web users



Magnetic field and field lines

(Questions offer you to draw magnetic field lines in different cases)

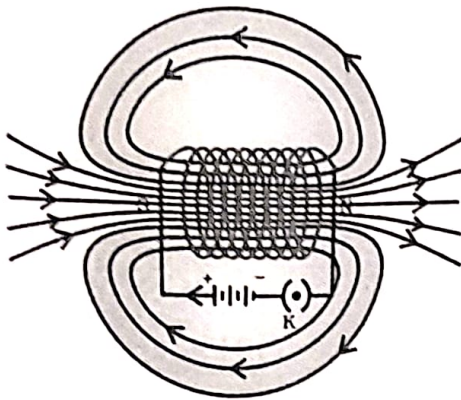


MAGNETIC
OF ELECTRIC

Current Carrying Conductor

- ☐ Straight Conductor
- ☐ Right Hand Thumb Rule
- ☐ Circular loop
- ☐ Solenoid

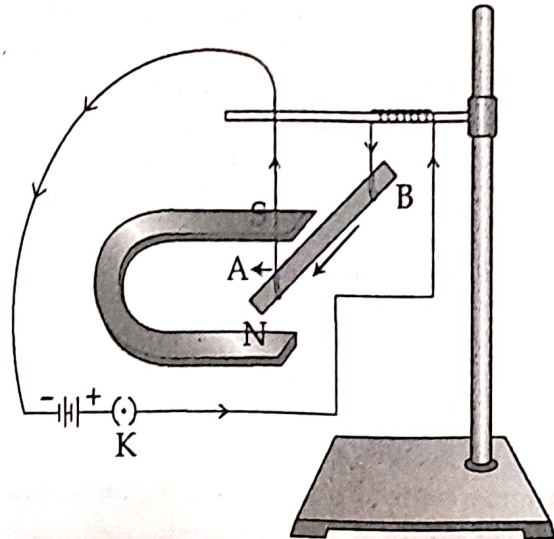
(CBSE loves circular loops and solenoids)



Force on a current carrying conductor in a magnetic field

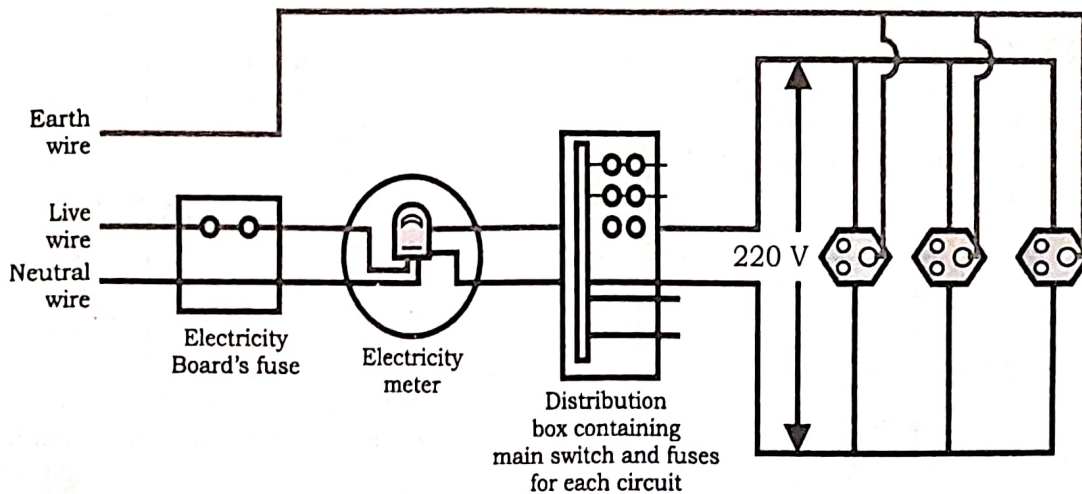
(Direction of force in various cases is questionable)

**EFFECTS
CURRENT**



Domestic Electric Circuit

(CBSE loves to ask questions on all three wires; Earth, Live and Neutral)



OBJECTIVE QUESTIONS

(DAY 10)

Multiple Choice Questions

Q.1. Choose the incorrect statement from the following regarding magnetic lines of field [NCERT Exemplar]

- (a) The direction of magnetic field at a point is taken to be the direction in which the north pole of a magnetic compass needle points.
- (b) Magnetic field lines are closed curves.
- (c) If magnetic field lines are parallel and equidistant, they represent zero field strength.
- (d) Relative strength of magnetic field is shown by the degree of closeness of the field lines.

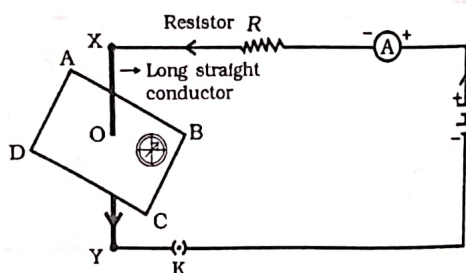
Q.2. The strength of the magnetic field is directly proportional to

COMPETENCY

- (a) Temperature.
- (b) Size of magnet.
- (c) Degree of closeness of the field lines.
- (d) None of these.

Q.3. If the key in the arrangement (Figure) is taken out (the circuit is made open) and magnetic field lines are drawn over the horizontal plane ABCD, the lines are

COMPETENCY



- (a) concentric circles
- (b) elliptical in shape
- (c) straight lines parallel to each other
- (d) concentric circles near the point O but of elliptical shapes as we go away from it

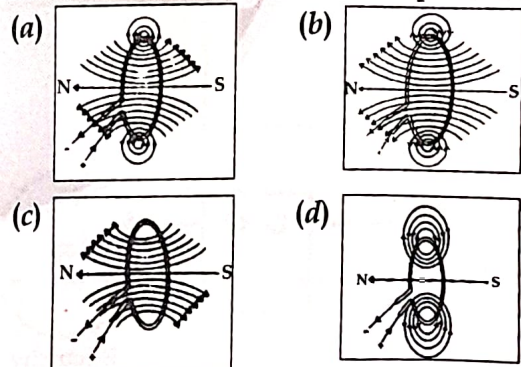
Q.4. For a current in a long straight solenoid N- and S-poles are created at the two ends. Among the following statements the incorrect statement is

COMPETENCY

- (a) The field lines inside the solenoid are in the form of straight lines which indicate that the magnetic field is the same at all points inside the solenoid.
- (b) The strong magnetic field produced inside the solenoid can be used to magnetise a piece of magnetic material like soft iron, when placed inside the coil.
- (c) The pattern of the magnetic field associated with the solenoid is different from the pattern of the magnetic field around a bar magnet.
- (d) The N- and S-poles exchange position when the direction of current through the solenoid is reversed.

Q.5. The correct pattern of magnetic field lines of the field produced by a current carrying circular loop is:

[CBSE 2022]

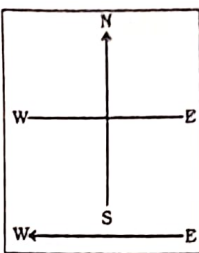


Q.6. The magnetic field inside a long straight current carrying solenoid:

COMPETENCY

- (a) is zero.
- (b) decreases as we move towards its end.
- (c) increases as we move towards its end.
- (d) is same at all points.

Q.7. A constant current flows in a horizontal wire in the plane of the paper from east to west as shown in Figure . The direction of magnetic field at a point will be North to South

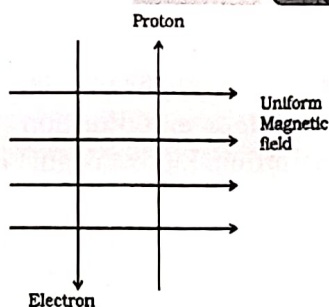


COMPETENCY

- (a) directly above the wire.
- (b) directly below the wire.
- (c) at a point located in the plane of the paper, on the north side of the wire.
- (d) at a point located in the plane of the paper, on the south side of the wire.

Q.8. A uniform magnetic field exists in the plane of paper pointing from left to right as shown in Figure. In the field, an electron and a proton move as shown. The electron and the proton experience

COMPETENCY



- (a) forces both pointing into the plane of paper.
- (b) forces both pointing out of the plane of paper.
- (c) forces pointing into the plane of paper and out of the plane of paper, respectively.
- (d) force pointing opposite and along the direction of the uniform magnetic field respectively.

Q.9. Which of the following property of a proton can change while it moves freely in a magnetic field?

- (a) Velocity
- (b) Momentum
- (c) Speed
- (d) Both (a) and (b)

Q.10. A positively-charged particle (alpha particle) projected towards west is

deflected towards north by a magnetic field. The direction of magnetic field is

COMPETENCY

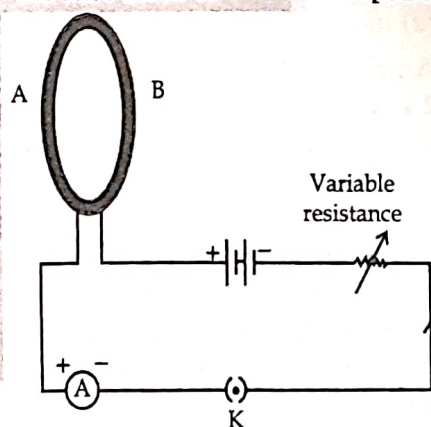
- (a) towards south
- (c) downward
- (b) towards east
- (d) upward

Q.11. Name the scientists who state "magnet must also exert an equal and opposite force on the current-carrying conductor"

COMPETENCY

- (a) Andre Marie Ampere
- (b) Alessandro Volta
- (c) Charles Darwin
- (d) Albert Einstein

Q.12. A circular loop placed in a plane perpendicular to the plane of paper carries a current when the key is ON. The current as seen from points A and B (in the plane of paper and on the axis of the coil) is anti clockwise and clockwise respectively. The magnetic field lines point from B to A. The N-pole of the resultant magnet is on the face close to [CBSE 2024]



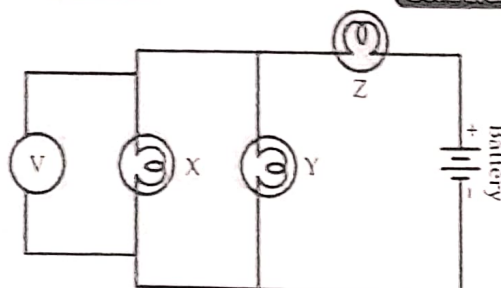
- (a) A
- (b) B
- (c) A if the current is small, and B if the current is large
- (d) B if the current is small and A if the current is large

Q.13. The direction of the force on the conductor depends upon.

- (a) Direction of current
- (b) Direction of the magnetic field
- (c) Both (a) and (b)
- (d) None of these

- Q.14. The given electric circuit consists of a voltmeter, a battery and three bulbs X, Y and Z.

COMPETENCY



The reading on the voltmeter represents the potential difference across which bulb(s)?

- (a) Only X (b) Both X and Y
(c) Both X and Z (d) All X, Y and Z
- Q.15. The most important safety method used for protecting home appliances from short circuiting or overloading is

COMPETENCY

- (a) earthing
(b) use of fuse
(c) use of stabilizers
(d) use of electric meter
- Q.16. An electric oven with a power rating of 2 kW is operated in a domestic electric circuit (220 V) with a current rating of 5 A. What result do you expect?

COMPETENCY

- (a) The fuse will explode due to high current flow and break the circuit.
(b) The fuse will melt due to high current flow and break the circuit.
(c) Nothing will happen.
(d) The oven will explode.
- Q.17. At the time of short circuit, the current in the circuit

- (a) reduces substantially.
(b) does not change.
(c) increases heavily.
(d) vary continuously

— Assertion Reason Questions —

Following questions consist of two statements: Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

- (a) Both A and R are true, and R is the correct explanation of A.
 (b) Both A and R are true, and R is not the correct explanation of A.
 (c) A is true but R is false.
 (d) A is false but R is true.

Q.1. Assertion: Electricity and magnetism are related phenomena.

Reason: A moving electric charge generates a magnetic field. **COMPETENCY**

Q.2. Assertion: No two magnetic field lines cross each other.

Reason: If they did cross each other, it would mean that at the point of intersection, the compass needle would point towards two directions, which is not possible. **COMPETENCY**

Q.3. Assertion: Iron filings scattered around a straight current carrying conductor in a plane perpendicular to the length of the conductor, arrange themselves in concentric circles.

Reason: Magnetic field has both magnitude and direction. **COMPETENCY**

Q.4. Assertion: Electromagnet is a temporary magnet.

Reason: Electromagnet acts as a magnet as long as the electric current flows through its coil.

Q.5. Assertion: An electron enters a magnetic field at right, then the direction of force acting on the electron will be into the page.

Reason: If we consider ourselves driving a corkscrew in the direction of the current, then the direction of the rotation of corkscrew is the direction of the magnetic field. **COMPETENCY**

Q.6. Assertion: Fleming's left-hand rule is used to determine the direction of magnetic field, speed and intensity of magnetic field.

Reason: The direction of the force on the conductor depends upon the direction of current and the direction of the magnetic field.

Q.7. Assertion: The earth wire is a safety measure.

Reason: In case of current leakage, the earth wire provides safe passage for the current and the user does not get an electric shock.

Q.8. Assertion: Nowadays, MCB is being used in place of a fuse in an electric circuit.

Reason: An MCB protects the circuit from getting damaged in case of overloading or short-circuit. **COMPETENCY**

ANSWERS

Multiple Choice Answers

1. (c) 2. (c) 3. (a) 4. (c)
 5. (b) 6. (d) 7. (b)
 8. (a)

FREE ADVICE: Padhle Gang! yaad rakhna ki direction of current is opposite to the direction of electron & in the same direction as of proton.

9. (d) 10. (d) 11. (a) 12. (c)

13. (c) 14. (b) 15. (b) 16. (b)
 17. (c)

Assertion-Reason Answers

1. (a) Both A and R are true, and R is the correct explanation of A.
 2. (a) Both A and R are true, and R is the correct explanation of A.
 3. (b) Both A and R are true, and R is not the correct explanation of A.

Explanation. The iron filings aligning in concentric circles around the current-carrying conductor illustrating the magnetic field's direction, and the magnetic field itself indeed has both magnitude and direction.

4. (a) Both A and R are true, and R is the correct explanation of A.
 5. (b) Both A and R are true, and R is not the correct explanation of A.
 6. (d) A is false but R is true.
 7. (a) Both A and R are true, and R is the correct explanation of A.
 8. (b) Both A and R are true, and R is not the correct explanation of A.

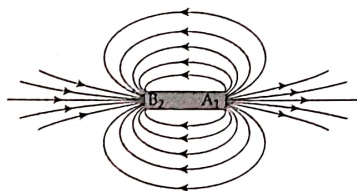
SUBJECTIVE QUESTIONS

Very Short Answer Questions

Q.1. What is a magnetic field?

Ans. A magnetic field is the region around a magnet in which attractive and repulsive forces can be detected.

Q.2. Identify the poles of the magnet in the given figure. **COMPETENCY**



Ans. A₁ → North pole, B₂ → South pole

Q.3. What type of core is used to make an electromagnet? **COMPETENCY**

Ans. Soft iron

Q.4. Imagine a current carrying circular loop of wire on the plane of your answer sheet. The magnetic field inside the loop is into the plane of the paper.

(i) What must be the direction of the current in the loop?

(ii) State the rule used here.

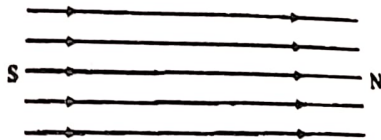
Ans. (i) The current is in a clockwise direction.

(ii) The right-hand thumb rule states that if you imagine that you are holding a current-carrying straight conductor

in your right hand such that the thumb points towards the direction of current. Then your fingers will wrap around the conductor in the direction of the field lines of the magnetic field.

Q.5. The magnetic field in a given region is uniform. Draw a diagram to represent it. [CBSE 2012]

Ans. Inside a solenoid magnetic field is uniform.



Q.6. Mention the angle between a current carrying conductor and magnetic field for which the force experienced by this current carrying conductor placed in magnetic field is largest? [CBSE 2012]

Ans. The force is maximum when the angle between the current-carrying conductor and the direction of the magnetic field is a right angle, which is 90° .

Q.7. State Fleming's left hand rule.

[CBSE 2018]

Ans. According to this rule, stretch the thumb, forefinger and middle finger of your left hand such that they are mutually perpendicular. If the first finger points in the direction of magnetic field and the second finger in the direction of current, then the thumb will point in the direction of motion or the force acting on the conductor.

Q.8. Name two organs in the human body where the magnetic field produced is significant? [CBSE 2012]

Ans. Heart and brain.

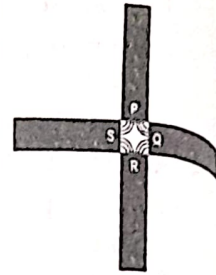
Q.9. State the use of earth wire in domestic electric circuit. [CBSE 2012]

Ans. To prevent any current leakage to the metallic body of the appliance does not pose a risk of electric shock to the user.

Q.10. Mention the colour code used for live, neutral and earth wire?

Ans. Live wire → Red, Neutral wire → Black
Earth wire → Green

Q.11. Quadrupole magnets consist of groups of four magnets and are used in particle accelerators.



The image below shows four bar

magnets configured to produce a quadrupole. The magnetic field lines between the magnets is marked. What are the poles of the magnets at P, Q, R and S? [CBSE 2012]

Ans. P & R: south pole,
Q & S: north pole

Q.12. Find the minimum rating if fuse that can be safely used on a line on which two 1.1 kW, electric geysers are to run simultaneously. The supply voltage is 220 V. [CBSE 2012]

Ans. $V = 220V$
 $P = 1.1 \text{ kW}$

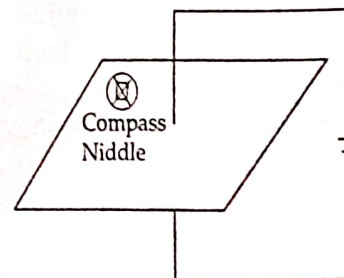
$$\text{Formula: } i = \frac{P}{V} = 2 \times 1.1 \times \frac{1000}{220} = 10 \text{ A}$$

Rating details of fuse should be more than 10A.

(DAY 10)

Short Answer Questions

Q.1. Mona was doing an experiment with a magnetic compass and a straight current-carrying wire. She observed that as she moved the compass away from the current-carrying wire, the deflection of the compass needle gets reduced. [CBSE 2024]



- A. Explain why did the deflection of the compass needle reduce as Mona moved away the compass needle from the current carrying wire.
- B. Mention one thing that could have changed in the circuit of the wire that could increase the deflection of the needle.
- C. Explain with reason what will be the direction of the magnetic field associated with the wire for the case described by the given figure.

Ans. A. Magnetic field strength is inversely proportional to the distance from the current carrying wire. Hence, when Mona moved the compass away from the current carrying wire, the magnetic effect was less on it and hence the deflection was less.

B. Magnetic field strength is directly proportional to the current in the wire. So, Mona could increase the current in the circuit to observe a greater deflection in the compass needle.

C. The battery suggests that the current is going from top of the plane to the bottom of the plane. Using the **right hand thumb rule** we can say that the magnetic field will be clockwise.

Q.2. What are magnetic field lines? List two characteristic properties of these lines.

[CBSE 2014]

Ans. Magnetic field lines represent the paths that a north magnetic pole would follow within a magnetic field. The direction of a magnetic field at a specific location is determined by using a small magnetic compass.

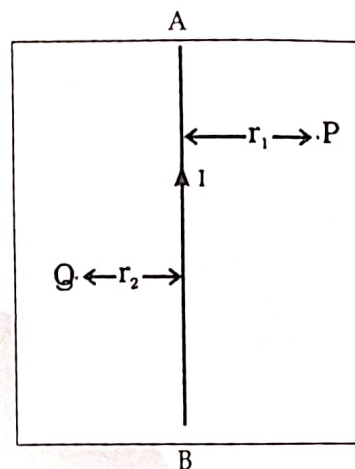
Characteristics of magnetic lines of force:

- The magnetic field lines of a magnet create a continuous closed loop.
- Magnetic lines of force do not cross each other.

Q.3. AB is a current carrying conductor in the plane of the paper as shown

in Figure. What are the directions of magnetic fields produced by it at points P and Q? Given $r_1 > r_2$, where will the strength of the magnetic field be larger?

COMPETENCY

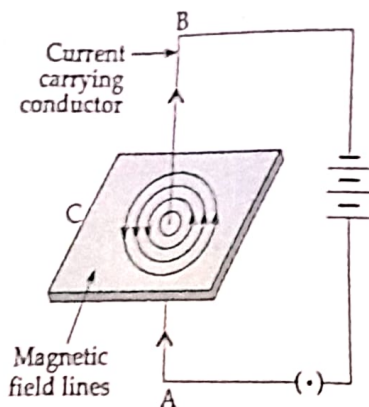


Ans. When current flows through a straight conductor, the magnetic field at point P is directed inside the paper according to Maxwell's right-hand thumb rule. On the other hand, at point Q, it is directed outside the paper. The strength of the magnetic field at P is greater than at Q because r_1 (the distance from P to the wire) is less than r_2 (the distance from Q to the wire). As you move farther away from the current carrying wire, the magnetic field weakens.

Q.4. Draw magnetic field lines produced around a current carrying straight conductor passing through a cardboard. Name, state and apply the rule to mark the direction of these field lines.

COMPETENCY

Ans. To determine the direction of magnetic field lines, you can use the- Right Hand Thumb Rule. Hold the current-carrying straight conductor in your right hand with your thumb pointing in the direction of the current. Your fingers will then naturally wrap around the conductor in the same direction as the field line.



Q.5. How does the strength of the magnetic field at the centre of a circular coil of a wire depend on

- radius of the coil
- number of turns in the coil.

[CBSE 2012]

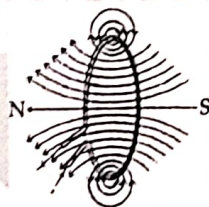
Ans. (a) The radius is inversely proportional to the field produced.

(b) The field produced is directly proportional to the number of turns in the coil.

Q.6. Explain with the help of the pattern of magnetic field lines the distribution of magnetic field due to a current carrying a circular loop.

COMPETENCY

Ans. The pattern of the magnetic field due to a current carrying circular loop consists of circular lines near the loop. However, the concentric circles representing magnetic field lines gradually increase in size. At the center of the circular loop, the magnetic field lines are straight. Therefore, as you move away from the center of the circular loop, the magnetic field lines continue to diverge.



Q.7. It is established that an electric current through a conductor produces a magnetic field around it. Is there a similar magnetic field produced around a thin beam of moving (i) alpha particles, (ii) neutrons? Justify your answer in each case. **COMPETENCY**

Ans. (i) Alpha particles are positively charged, so they create a current in the direction of their motion. Consequently, a magnetic field will be generated around a thin beam of moving alpha particles.

(ii) Neutrons are electrically neutral, so they do not create any current. Therefore, no magnetic field will be produced around a thin beam of moving neutrons.

Q.8. A uniform magnetic field is directed vertically upwards. In which direction in this field should an α -particle (which are positively charged particles) be projected so that it is deflected southward? Name and state the rule you have used to find the direction in this case. [CBSE 2015]

Ans. An alpha particle carries a positive charge. When applying Fleming's left-hand rule, it determines that the direction of motion of a positively charged alpha particle is from west to east.

Fleming's Left-Hand Rule involves stretching the first three fingers of the left hand mutually perpendicular to each other. In this arrangement, the forefinger points in the direction of a magnetic field, the middle finger points in the direction of current, and the thumb indicates the direction of the force experienced by the conductor. This rule is applied to determine the relationship between the direction of current and the magnetic field, which must be perpendicular to each other.

Q.9. Mention the provision of two different current ratings in our domestic circuits. Explain with reason, the advantage of such a provision. **COMPETENCY**

Ans. The two distinct current ratings available in domestic circuits are 5 A and 15 A. This is due to variations in power ratings among different electrical appliances, causing them to draw

varying currents when connected to the mains. Some appliances require lower currents, while others demand higher currents.

Q.10. Explain the function of an earth wire. Why is it necessary to link earth wire to metallic appliances? **COMPETENCY**

Ans. The earth wire serves as a safety precaution, particularly for appliances with a metallic body, such as electric irons and toasters. The metallic body is linked to the earth wire, which establishes a low-resistance conducting route for the current. This guarantees that any current leakage to the metallic body of the appliances maintains its potential equivalent to that of the earth, preventing the user from experiencing a severe shock.

(DAY 11)

Long Answer Questions

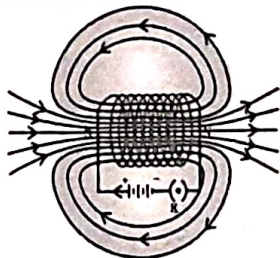
Q.1. What is a solenoid? Draw the pattern of magnetic field lines of
(a) a current carrying solenoid and
(b) a bar magnet. List two distinguishing features between the two fields.

[CBSE 2019]

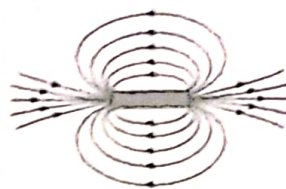
Ans. A solenoid refers to a coil made up of numerous closely wound circular turns of insulated copper wire shaped like a cylinder.

Distinguishing features between the two fields are as follows:

(a) A solenoid generates a magnetic field only when there is current flowing through its coils, whereas a bar magnet generates a permanent magnetic field that does not require a current.



(b) The strength of the magnetic field generated by a solenoid can be adjusted,



whereas the magnetic field strength produced by a bar magnet remains constant.

- Q.2.** (a) A stationary charge is placed in a magnetic field. Will it experience a force? Give reason to justify your answer.
(b) On what factors does the direction of force experienced by a conductor when placed in a magnetic field depend?
(c) Under what conditions is the force experienced by a current carrying conductor placed in a uniform magnetic field maximum?
(d) Name and state the rule which gives the direction of force experienced by a current carrying conductor placed in a magnetic field.

[CBSE 2012]

- Ans.** (a) No, a magnetic field only impacts moving charges.
(b) The direction of the force is dependent upon the current's direction and the magnetic field's direction.
(c) The force is at its maximum when the current flows perpendicular to the magnetic field's direction.
(d) Fleming's Left-Hand Rule involves stretching the first three fingers of the left hand mutually perpendicular to each other. In this arrangement, the forefinger points in the direction of a magnetic field, the middle finger points in the direction of current, and the thumb indicates the direction of the force experienced by the conductor. This rule is applied to determine the relationship between the direction of current and the magnetic field, which must be perpendicular to each other.

Q.3. (a) State the function of a fuse in an electric circuit. How is it connected in the domestic circuit?

(b) An electric fuse of rating 3A is connected in a circuit in which an electric iron of power 1.5 kilowatt is connected which operates at 220 V. What would happen? Explain.

[CBSE 2015]

Ans. (a) It is employed to regulate the current flow in a circuit. A fuse is placed in series with the circuit.

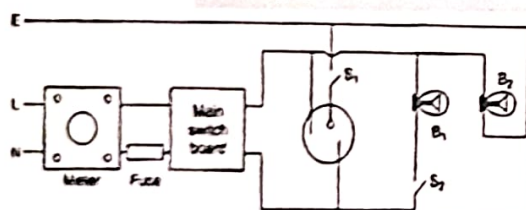
(b) $V = 220V$
 $P = 1.5kW$

$$\text{Formula: } I = \frac{P}{V}$$

$$= 1.5 \times \frac{1000}{220} = 6.8A$$

The electric fuse will blow up because rating of electric fuse is 3A.

Q.4. (i) The given figure shows a domestic electric circuit. Study this circuit carefully. List any two errors in the circuit and justify your answer.



(ii) Give one difference between the wires used in the element of an electric heater and in a fuse.

(iii) List two advantages of parallel connection over series connection.

COMPETENCY

Ans. (i) Two error.

(a) Bulb B_2 is not connected to the neutral wire.

(b) Fuse is incorrectly connected to the neutral wire (N), it must be connected to the live wire (L).

(ii) Element of electric heater has high melting point while element of fuse wire has low melting point.

(iii)(a) Each appliance has a separate switch to turn the flow of current on or off.

(b) Each appliance has the same potential difference.

Q.5. List four important features of domestic electric circuits. Draw a schematic diagram of common domestic circuit showing live, neutral and earth wires.

COMPETENCY

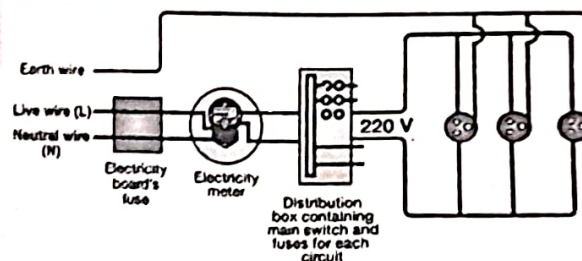
Ans. Four features of domestic electric circuit are:

(a) Different appliances can be connected across both the live wires and the neutral wire in each circuit.

(b) Appliances should be connected in parallel.

(c) Distribution box containing main switch and MCB for each circuit.

(d) Each appliance has an individual switch to control the flow of current through it.

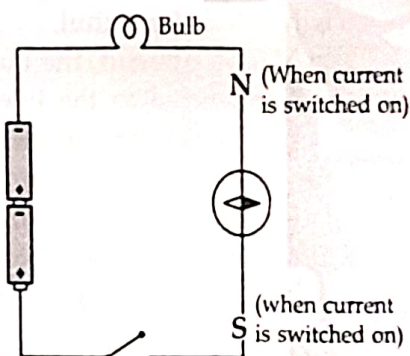


CASE BASED QUESTIONS

Q.1. In 1820, Hans Christian Oersted discovered that a magnetic needle is deflected by a current-carrying wire. For many years, he had expected to find a connection between electricity and magnetism.

Before his discovery, Oersted had imagined the magnetic field to be a straight line along the direction of the wire with the north pole at one end and the south pole at the other. This was a major reason why he took so long to discover electromagnetism.

The figure below shows how Oersted would have arranged his wire and magnetic needle in his early experiments.



How Oersted imagined the magnetic field

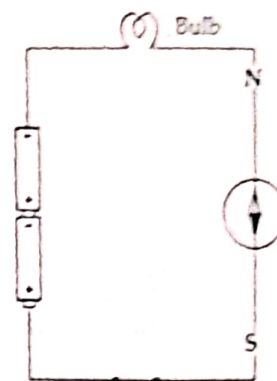
Answer the following:

(a) Draw a diagram to show the observation that Oersted would have expected when switching on the current, if his hypothesis had been correct. **COMPETENCY**

(b) Write two properties of magnetic field?

(c) Based on our current knowledge of the magnetic field around a wire, explain why his experiment failed? **COMPETENCY**

Ans. (a) Magnetic field lines are closed curves.

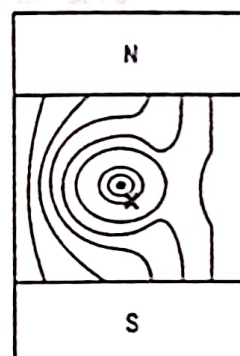


(b) (i) Magnetic field does not intersect each other.

(ii) The magnetic field due to the current is perpendicular to the wire.

(c) Since the needle is already pointing in a direction perpendicular to the wire, it will not get deflected.

Q.2. The image below shows the cross-section of a wire placed between the poles of a magnet. The wire carries an electric current out of the plane of the page.



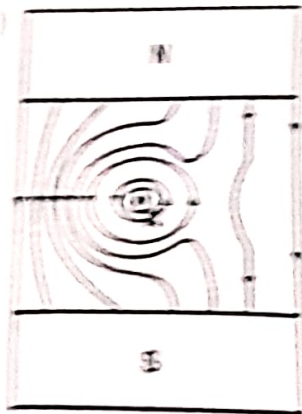
Both the current carrying wire and the magnet generate a magnetic field. The resulting shape of the magnetic field is as shown.

(a) Draw arrows on the magnetic field lines to mark the direction of the magnetic field. **COMPETENCY**

(b) What is the direction of the force acting on the current carrying wire?

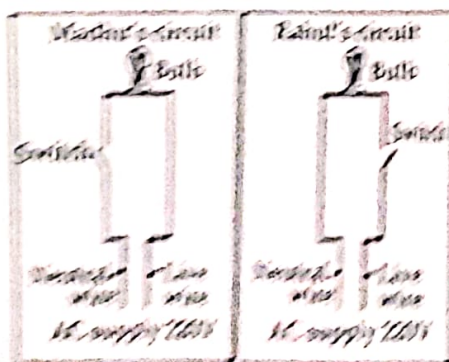
- (c) Name and state the rule you used to determine the direction of force in (b).

Ans. (a)



- (b) The wire experiences a force towards the left.
 (c) Fleming's left hand rule. According to this rule, if we stretch the thumb, the forefinger and the middle finger of the left hand such that they are mutually perpendicular to each other and the forefinger points in the direction of magnetic field and the second finger in the direction of current, then the thumb will point in the direction of motion or the force acting on the conductor.

Q2. In physics practical, the aim was to make a complete working electric circuit, so Madhu and Rahul completed the experiment. Now, observe Madhu's and Rahul's circuits shown below and answer the following:



- (a) In which circuit will the bulb glow when the switch is closed? Explain why.
 (b) What is the potential difference between live and neutral wire in our country?
 (c) Both Madhu and Rahul open the switches in their circuits to change the bulbs. For whom will changing the bulb be safe and for whom will it be dangerous? Explain why.

Conclusion

Ans. (a) The bulb will glow in both the circuits because circuits will be closed/complete.

(b) 220V

- (c) Changing the bulb will be dangerous for Madhu but changing the bulb will be safe for Rahul.

In Madhu's circuit, the bulb point is still connected to the live wire and can give an electric shock even when the switch is in the open position.

In Rahul's circuit, the bulb point is no longer connected to the live wire when the switch is in the open position.

(DAY 11 SWAHA)

6

Light-Reflection and Refraction



What did CBSE ask last year?

MCQs & A/R	2 Questions ($2 \times 1 = 2$ Marks)
Subjective	2 Very Short Questions ($2 \times 2 = 4$ Marks)
	2 Short Questions ($2 \times 3 = 6$ Marks)
	No Long Questions Asked
Case Based	No Case Based Questions Asked

Note: All the above typology of questions include 'Competency based questions' labelled as **COMPETENCY**.

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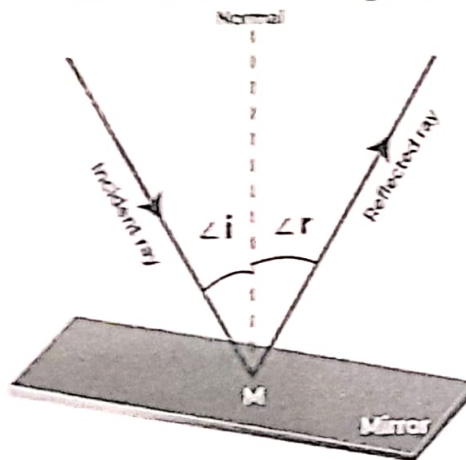
Scan this for
App Store and
Web users



Reflection of Light

□ Laws of reflection is asked in very short & short questions.

Reflection of Light



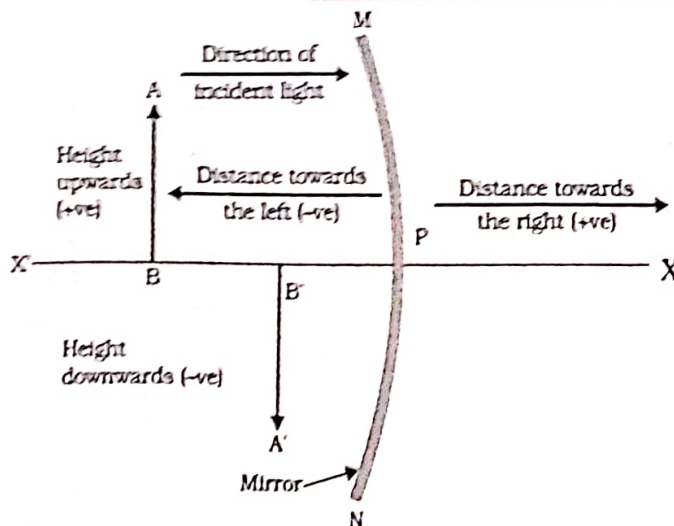
**LIGHT—R
AND REF**

Spherical Mirrors

- Image Formation
- Uses of Images
- Sign Convention
- Mirror Formula and Magnification

(Easy numericals are asked, just master the concept of sign convention.)

Mirror Formula: $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ and magnification of mirror: $m = \frac{v}{u}$



Refraction of Light

☐ Rectangular glass slab

☐ Refractive Index

$$n = \frac{\sin i}{\sin r}$$

...where i is \angle incidence and r is \angle refraction.

$$n = \frac{c}{v}$$

...where c is the speed of light i.e. 3×10^8 m/s and v is the speed of light in any material

☐ Spherical Lenses

☐ Image Formation

☐ Lens Formula and Magnification

$$\text{lens formula} = \frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

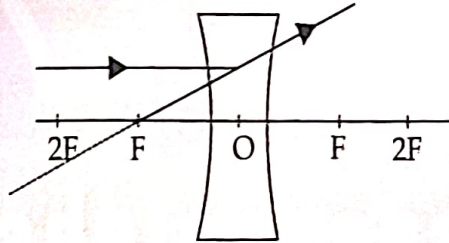
$$\text{magnification of lens, } m = \frac{v}{u}$$

☐ Power of Lens

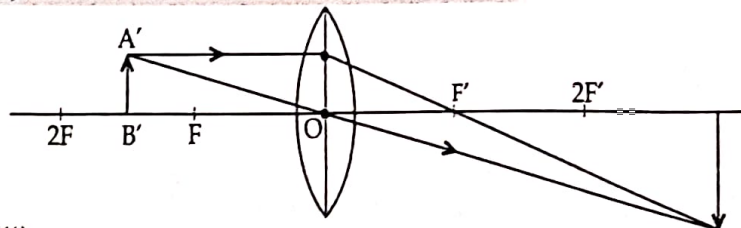
$$P = \frac{1}{f}; f \text{ is focal length in meters}$$

☐ Some important ray diagrams:

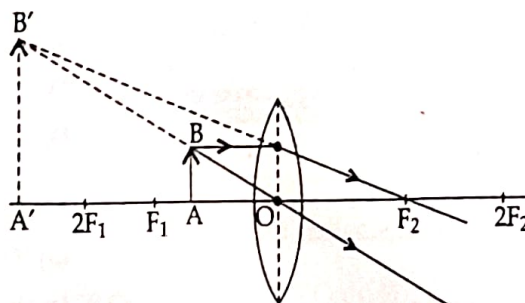
(i)



(ii)



(iii)



OBJECTIVE QUESTIONS

(DAY 12)

Multiple Choice Questions

Q1. In the diagram shown below, a light ray is incident on a convex mirror.

CONTINUE



Through which point will the ray travel after reflecting off the mirror?

- (a) C
- (b) E
- (c) F
- (d) D

Q2. As a ray of light entered medium P from medium Q, its velocity increased. What can be said about the refractive index of medium P as compared to that of the medium Q?

CONTINUE

- (a) It is lower.
- (b) It is higher.
- (c) It is the same.
- (d) Nothing can be said without knowing what medium P and medium Q are.

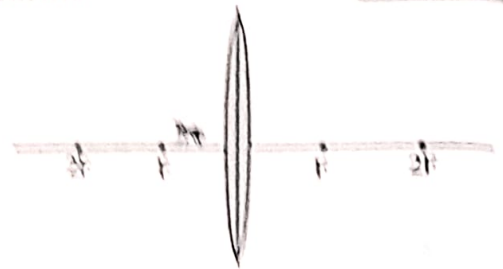
Q3. An object was placed at the centre of curvature of a concave lens. The image formed by the lens would be _____.

CONTINUE

- (a) virtual, erect and same size as the object.
- (b) virtual, erect and smaller than the object.
- (c) virtual, inverted and larger than the object.
- (d) real, inverted and same size as the object.

Q4. An ant was in front of a convex lens as shown.

CONTINUE



Which of the following shows the image of the ant observed through the convex lens?

- (a)
- (b)
- (c)
- (d)

Q5. In torch lights and head lights of vehicles, the bulb is placed _____.

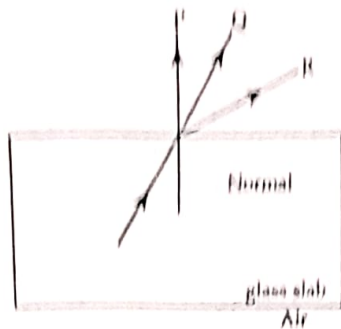
[CBSE 2024]

- (a) between the pole and the focus of the reflector.
- (b) very near to the focus of the reflector.
- (c) between the focus and centre of curvature of the reflector.
- (d) at the centre of curvature of the reflector.

Q6. A concave mirror produces three times the magnified (enlarged) real image of an object placed at 10 cm in front of it. Where is the image located?

- (a) 30 cm in front of the mirror
- (b) 50 cm in front of the mirror
- (c) 10 cm in front of the mirror
- (d) 90 cm in front of the mirror

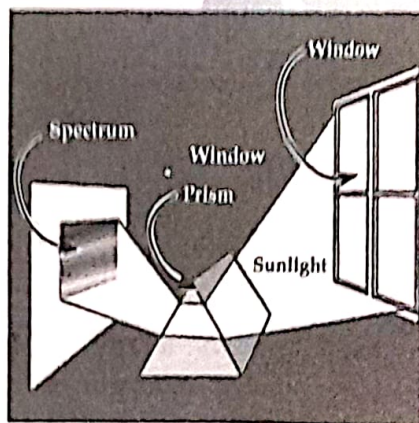
Q7. In the diagram shown here, a beam of light is travelling from inside a glass slab to air.



Which of the marked paths will the ray of light take as it emerges from the glass slab?

- (a) P
- (b) Q
- (c) R
- (d) None of them as light splits into its many colours.

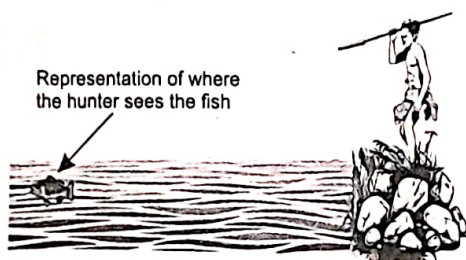
Q.8. The image below depicts light being split by a prism into different colours.



This was first observed by Isaac Newton. What would this observation help us to understand?

- (a) the cause for sunspots
- (b) how x-rays are formed
- (c) the cause for rainbows
- (d) how the sun produces light

Q.9. A hunter sees a fish which is swimming in clear water as shown in the figure.



To hit the fish, he should take aim adjusting for the fish's motion and

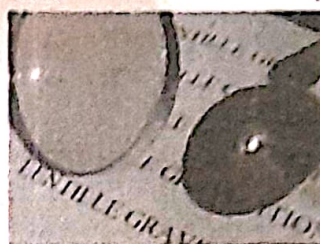
COMPETENCY

- (a) exactly at the depth where the fish appears to be
- (b) a little below where the fish appears to be
- (c) a little above where the fish appears to be
- (d) at the fish's eye, exactly where it appears to be

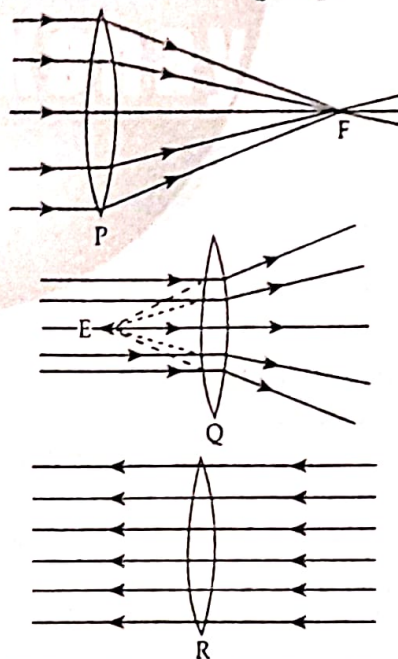
Q.10. Shown below is a photograph of a convex lens.

A small, bright spot is seen on the paper when the lens is kept out facing the sun.

[CBSE 2024]

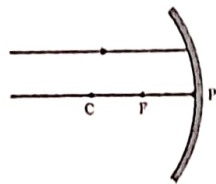


Which diagram below explains the formation of the bright spot?

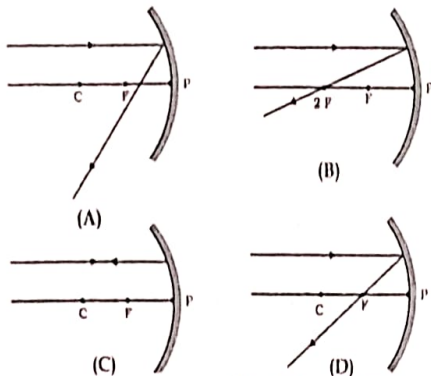


- (a) Only P
- (b) Only Q
- (c) Only R
- (d) both P and Q

Q.11. Which of the following ray diagrams is correct for the ray of light incident on a concave mirror as shown in Figure.

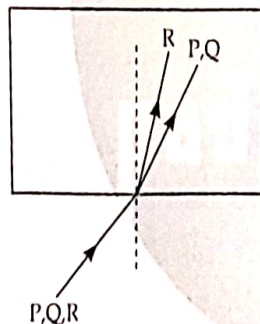


COMPETENCY



- (a) Fig. A (b) Fig. B
(c) Fig. C (d) Fig. D

Q.12. A beam of light consisting of three rays—P, Q, R is incident on a transparent plastic block from air as shown in the figure below.



Which of the following statements is true?

COMPETENCY

- (a) Refractive index for P is greater than that for Q.
(b) Refractive index for P is greater than that for R.
(c) Refractive index for R is greater than that for Q.
(d) Refractive index for P, Q and R is the same.

Q.13. Light enters from air to glass having refractive index 1.50. What is the speed of light in the glass? The speed of light in vacuum is $3 \times 10^8 \text{ ms}^{-1}$

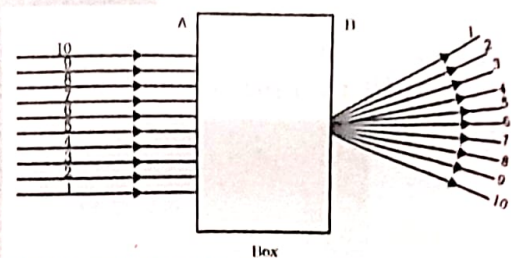
- (a) $2 \times 10^3 \text{ m/s}$ (b) $2 \times 10^8 \text{ m/s}$
(c) $2 \times 10^3 \text{ m/s}$ (d) None of these

Q.14. If an object is at focus F_1 , then what will be the position of the image formed by the convex lens?

- (a) On the same side of the lens as the object
(b) Beyond $2F_2$
(c) At $2F_2$
(d) At infinity

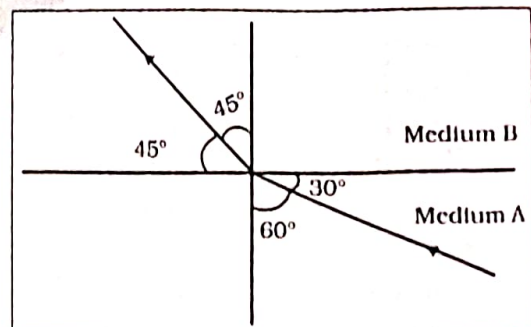
Q.15. Light is incident through the holes on side A and emerges out of the holes on the other face of the box as shown in the Figure. Which of the following could be inside the box?

COMPETENCY



- (a) Concave lens
(b) Rectangular glass slab
(c) Prism
(d) Convex lens

Q.16. Figure shows a ray of light as it travels from medium A to medium B. Refractive index of the medium B relative to medium A is



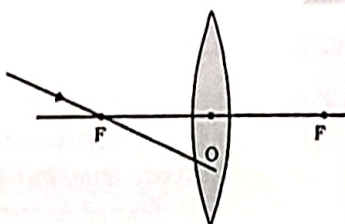
COMPETENCY

- (a) $\frac{\sqrt{3}}{\sqrt{2}}$ (b) $\frac{\sqrt{2}}{3}$
(c) $\sqrt{3}$ (d) 0

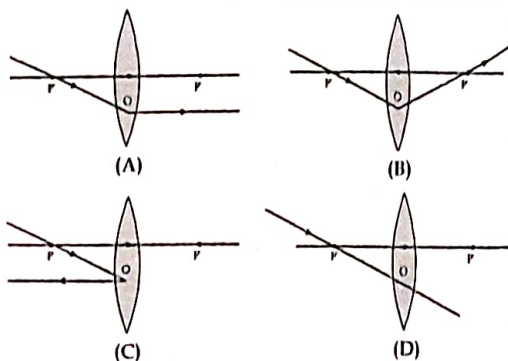
Q.17. Which of the following statements is true? [NCERT Exemplar]

- (a) A convex lens has 4 dioptre power having a focal length 0.25 m
- (b) A convex lens has -4 dioptre power having a focal length 0.25 m
- (c) A concave lens has 4 dioptre power having a focal length 0.25 m
- (d) A concave lens has -4 dioptre power having a focal length 0.25 m

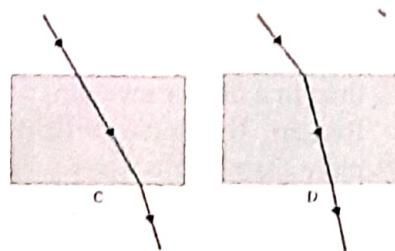
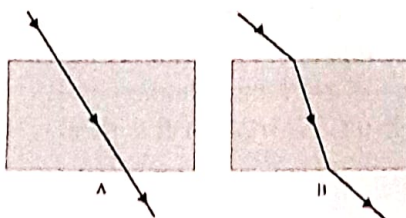
Q.18. Which of the following ray diagrams is correct for the ray of light incident on a lens showing in figure.



COMPETENCY



Q.19. The path of a ray of light coming from air passing through a rectangular glass slab traced by four students are shown as A, B, C and D in Figure. Which one of them is correct? **COMPETENCY**



- (a) A
- (b) B
- (c) C
- (d) D

Assertion Reason Questions

Following questions consist of two statements: Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

- (a) Both A and R are true, and R is the correct explanation of A.
- (b) Both A and R are true, but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

Q.1. **Assertion.** Bouncing back of light after striking a surface is called reflection of light.

Reason. A smooth, polished and shining surface reflects most of the light falling on it

Q.2. **Assertion.** Mirrors whose reflecting surfaces are spherical are called spherical mirrors.

Reason. The image formed by a plane mirror is always virtual and erect

Q.3. **Assertion.** A real image can be obtained on a screen.

Reason. A real image is always an inverted image. **COMPETENCY**

Q.4. **Assertion:** A concave mirror is used as a dentist's mirror.

Reason: A concave mirror forms an enlarged image of the teeth **COMPETENCY**

Q.5. **Assertion:** Concave mirrors are commonly used for torches to get powerful beams of light. **COMPETENCY**

Reason: Concave mirrors are often used as shaving mirrors to see larger images of the face.

Q.6. Assertion. The speed of light is comparatively more in a rarer medium than in a denser medium.

Reason. The speed of light in glass is more than that in water. **COMPETENCY**

Q.7. Assertion. The magnification of a concave lens is always positive.

Reason. Positive sign of magnification signifies that the image is virtual and erect. **COMPETENCY**

Q.8. Assertion. The power of a lens is defined as the reciprocal of its focal length.

Reason. It is represented by the letter.

Q.9. Assertion. The ratio of the sine of the angle of incidence to the sine of the angle of refraction is a constant. **COMPETENCY**

Reason. The incident ray, the refracted ray and the normal to the two transparent media at the point of incidence all lie in different planes.

ANSWERS

Multiple Choice Answers

1. (c) 2. (a) 3. (b) 4. (c)
5. (b) 6. (a) 7. (c) 8. (c)
9. (b) 10. (a) 11. (d) 12. (c)
13. (b) Formula used: $n = \frac{c}{v} \Rightarrow v = \frac{c}{n}$
 Speed of light in glass = $\frac{c}{n} = \frac{3 \times 10^8}{1.50}$

$$v = \frac{30 \times 10^8}{15} \text{ m/s}$$

$$\therefore v = 2 \times 10^8 \text{ m/s}$$
14. (d)
15. (d) Explanation. Light seems diverging out of the box, hence it's convex lens.
16. (c) Explanation. $n_A = \frac{\sin 30^\circ}{\sin 45^\circ} = \frac{1}{2} \times \sqrt{2}$

$$n_B = \frac{\sin 60^\circ}{\sin 45^\circ} = \frac{\sqrt{3} \times \sqrt{2}}{2}$$

$$\Rightarrow \frac{n_B}{n_A} = \frac{\frac{\sqrt{3} \times \sqrt{2}}{2}}{\frac{1 \times \sqrt{2}}{2}}$$

$$\therefore n_B = \sqrt{3} n_A$$

17. (a) 18. (A)

19. (b) Explanation. Remember DRAN: Denser to Rarer is away from Normal which means if light travels from denser to rarer material, the rays will bend away from the Normal; and vice versa when it travels from rarer to denser.

Assertion-Reason Answers

1. (b) Both A and R are true, but R is not the correct explanation of A.
2. (b) Both A and R are true, but R is not the correct explanation of A.
3. (b) Both A and R are true, but R is not the correct explanation of A.

FREE ADVICE: Real image is always inverted, whereas Virtual image is always erect.

4. (a) Both A and R are true, and R is the correct explanation of A.
5. (b) Both A and R are true, and R is not the correct explanation of A.
6. (b) Both A and R are true, but R is not the correct explanation of A.
7. (b) Both A and R are true, but R is not the correct explanation of A.

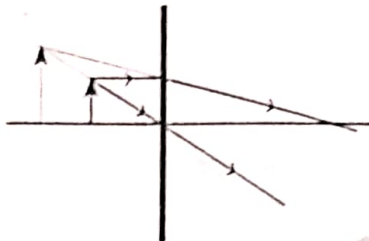
FREE ADVICE: +sign of magnification signifies that image is bigger than the size of object, virtual and erect; whereas -ve sign of magnification signifies that the image is diminished, real and inverted.

8. (b) Both A and R are true, but R is not the correct explanation of A.
9. (c) A is true but R is false.

SUBJECTIVE QUESTIONS

— Very Short Answer Questions —

Q.1. The given figure shows the formation of an image by a lens shown by a thick line.



Analyse the figure and answer the following questions.

- What is the type of lens used?
- What is the nature of the image?
- If the image is formed at a distance of 30 cm from the lens and the image is twice the size of the object, then where is the object placed?

Ans. A. The lens is a *convex lens* as convex lens forms a magnified erect image when the object is placed between the optical centre and principal focus of the lens.

B. Nature of the image is *virtual*.

C. Given. $v = -30$ cm,

$$\text{A.T. Q. } h_2 = 2h_1 \quad \dots(i)$$

...[\because Same side of the object]

$$\therefore m = \frac{h_2}{h_1} = \frac{v}{u}$$

$$\Rightarrow \frac{2h_1}{h_1} = \frac{-30}{u} \quad \dots[\text{From (i)}]$$

$$\therefore u = \frac{-30}{2} = -15 \text{ cm}$$

Hence, object is placed 15 cm from the lens.

Q.2. A 4 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 20 cm. The distance of the object from the lens is 15 cm. Find the nature, position and the size of the image formed. **COMPETENCY**

Ans. Given, $u = -15$ cm, $f = 20$ cm, $v = ?$

Using lens formula, $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

$$\frac{1}{v} + \frac{1}{15} = \frac{1}{20}$$

$$\Rightarrow \frac{1}{v} = \frac{1}{20} - \frac{1}{15}$$

$$\Rightarrow \frac{1}{v} = \frac{3-4}{60}$$

$$\Rightarrow \frac{1}{v} = \frac{-1}{60} \quad \therefore v = -60 \text{ cm}$$

$$\text{Now, } m = \frac{h_1}{h_2} = \frac{v}{u} = \frac{60}{15} = 4$$

Image formed is virtual, erect and magnified.

Q.3. Why do we prefer a convex mirror as a rear view mirror in vehicles?

COMPETENCY

Ans. A convex mirror is used as a rearview mirror in vehicles because it always forms a virtual, fully diminished and erect image of even distant objects and it also has a large aperture.

Q.4. Write two important applications of

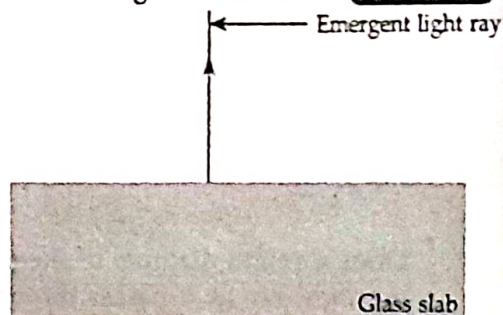
(a) concave mirror

(b) convex mirror **[CBSE 2011, 13]**

Ans. (a) Concave mirrors. Dentist mirror and mirror in torches.

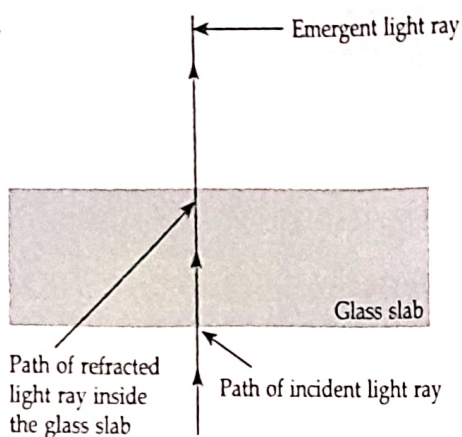
(b) Convex mirror. Rear view mirror and reflectors in streetlight.

Q.5. The ray of light emerging from a rectangular glass slab into air is shown in the diagram below. **COMPETENCY**



Copy the diagram and draw the path of the same light ray as it enters from air and passes through the glass slab.

Ans.



Explanation. 1 mark for drawing the incident ray entering the glass slab and 1 mark for drawing the refracted ray as it passes through the glass slab.

Q.6. The radius of curvature of a spherical mirror is 20 cm. What is its focal length? [NCERT, CBSE 2016]

Ans. Given: $R = 20$,

$$R = 2f$$

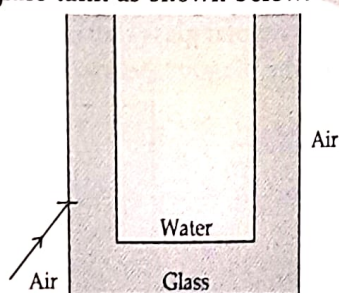
$$\therefore f = \frac{R}{2} = \frac{20}{2} = 10 \text{ cm}$$

The focal length of the spherical mirror is 10 cm.

Q.7. List four properties of the image formed by a concave mirror when object is placed between focus and pole of the mirror. [CBSE 2012]

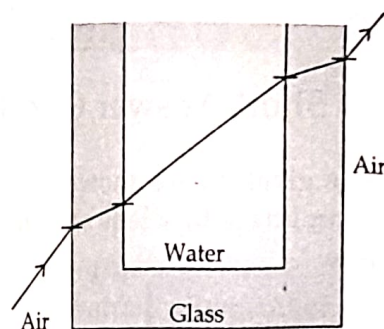
Ans. An image is virtual, erect, magnified and behind the mirror.

Q.8. A light ray is incident on the wall of a glass tank as shown below:



Draw a rough diagram of the path of the light ray as it passes through the glass tank and the water and emerges again into air. Draw the normal at each interface.

Ans.



Explanation. (0.5 marks each for drawing the rays correctly at each interface, 1 mark for drawing the normal at each interface.)

Q.9. Define absolute refractive index and express it mathematically. [CBSE 2019]

Ans. The ratio of the speed of light in air or vacuum to the speed of light in any medium is called the absolute refractive index.

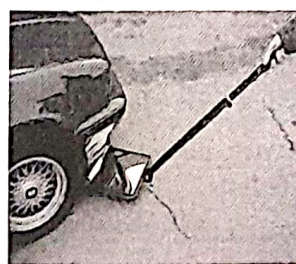
If 'c' is the speed of light in air and v is the speed of light in the medium, then the refractive index of the medium is given by:

Refractive Index (n)

$$= \frac{\text{Speed of light in air}}{\text{Speed of light in the medium}}$$

$$= \frac{c}{v}$$

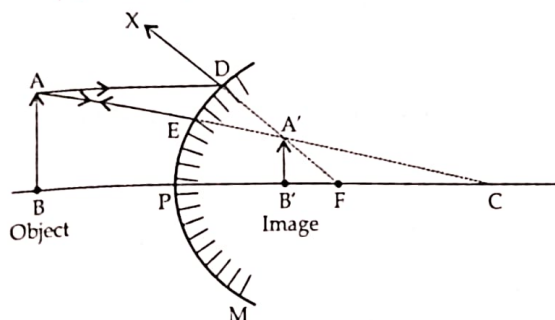
Q.10. Search mirrors are mirrors that are used to look for hidden objects underneath the cars as shown. The hidden objects can be easily spotted as the mirror provides a wider field of view.



(a) What type of mirrors are generally used to make search mirrors?

(b) With the help of a ray diagram describe the nature of image formed by the type of mirror identified in (a).

- Ans. (a) Convex mirror
(b) Virtual, erect and diminished.



Q.11. Find the power of a concave lens of focal length 2 m.

Ans. Given. $f = 2\text{ m}$

We know that,

$$P = \frac{1}{f}$$

$$\therefore P = \frac{1}{-2} = -0.5\text{ D}$$

Q.12. Find the focal length of a lens of power -2.0 D . What type of lens is this?

Ans. We know that power of the lens $= \frac{1}{f}$

$$P = -2\text{ D}$$

$$\therefore f = \frac{-1}{2} = -0.5\text{ m}$$

The value of focal length is negative so the lens will be concave lens.

Q.13. Give two uses of a convex lens. [CBSE 2015]

- Ans. (i) In microscope lens
(ii) In camera lens

Q.14. What does negative magnification mean? [CBSE 2013]

Ans. Negative magnification means that the size of the image is less than that of the object.

(DAY 13)

Short Answer Questions

Q.1. An object is placed at a distance of 30 cm in front of a convex mirror of focal length 15 cm. Write four characteristics of the image formed by the mirror.

[CBSE 2017, 2015]

Ans. Four characteristics of the image formed are:

- The image is erect.
- The image is diminished in size.
- The image is virtual.
- The image is formed behind the mirror between points P and F.
- The image is laterally inverted.

$$\text{Explanation: } \frac{1}{f} = \frac{1}{v} + \frac{1}{u} \Rightarrow \frac{1}{v} = \frac{1}{f} - \frac{1}{u}$$

$$\Rightarrow \frac{1}{v} = \frac{1}{15} - \frac{1}{(-30)} = \frac{2+1}{30} = \frac{3}{30}$$

$$\text{Now, } m = \frac{-v}{u} = \frac{-10}{-30} = \frac{1}{3} \approx 0.33$$

is the magnification.

Q.2. A student wants to project the image of a candle flame on a screen 48 cm in front of a mirror by keeping.

- The flame at a distance of 12 cm from its pole.

Suggest the type of mirror he should use.

- Find the linear magnification of the image produced.
- How far is the image from its object?
- Draw ray diagram to show the image formation in this case. [CBSE 2014]

Ans. (a) Concave mirror

(b) Given.

$$v = -12 \quad \text{and } u = -48$$

$$m = \frac{-v}{u} \Rightarrow m = \frac{(+12)}{(-48)}$$

$$\text{Hence } m = -4$$

The magnification of the image formed is real and inverted.

- The image is formed at a distance of 36 cm from the object.

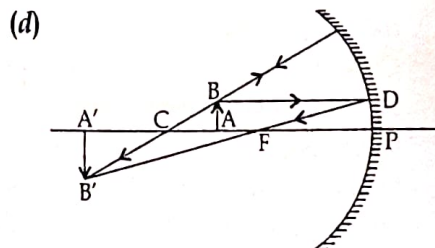


Image formed is real, inverted, magnified and beyond $2f$.

Q.3. Absolute refractive indices of two media P and Q are 1.33 (n_P) and 2.52 (n_Q) respectively. The speed of light in medium P is 2×10^8 m/s.

(a) What would be the speed of light in medium Q (V_Q)?

(b) If the angle of incidence for a ray of light travelling from medium P to Q is 0° , then what will be the path of light in the medium Q?

Ans. (a) $n_P = (\text{Speed of light in vacuum} / \text{speed of light in medium P})$

$n_Q = (\text{Speed of light in vacuum} / \text{speed of light in medium Q})$

Therefore,

$$\frac{n_P}{n_Q} = \frac{V_Q}{V_P} \Rightarrow \frac{1.33}{2.52} = \frac{V_Q}{2 \times 10^8}$$

$$\therefore V_Q = \frac{1.33 \times 2 \times 10^8}{2.52}$$

$$= 1.056 \times 10^8 \text{ m/s}$$

(b) The ray will travel undeviated through the medium Q.

Q.4. List two possible ways in which a concave mirror can produce a magnified image of an object placed in front of it. State the difference, if any, between these two images. [CBSE 2014, 2016]

Ans. Case I. A concave mirror can produce an erect, magnified, virtual image when the object is placed between the pole and focus of the mirror. When an object is placed between the pole (P) and focus (F) of a concave mirror, the image formed is larger than the object (or magnified).

Case II. A concave mirror also produces an inverted, magnified, real image when the object is placed between the focus and the center of curvature. When an object is placed between the focus (F) and center of curvature (C) of a concave

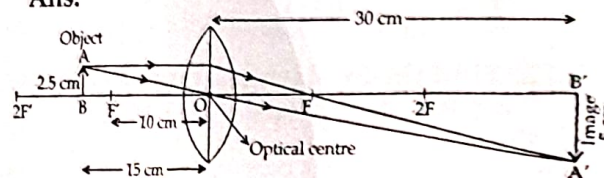
mirror, the image formed is larger than the object.

Case I	Case II
- Image is formed behind the mirror.	- Image is formed beyond the center of curvature and is real.
- Image formed is erect and virtual.	- Image formed is inverted.

Q.5. An object of height 2.5 cm is placed at a distance of 15 cm from the optical centre 'O' of a convex lens of focal length 10 cm. Draw a ray diagram to find the position and size of the image formed. Mark optical centre 'O', principal focus and height of the image on the diagram.

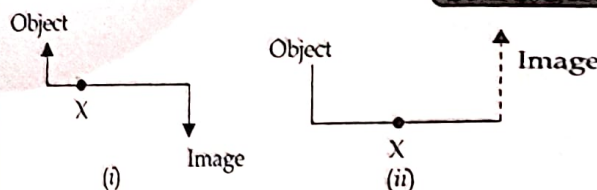
COMPETENCY

Ans.

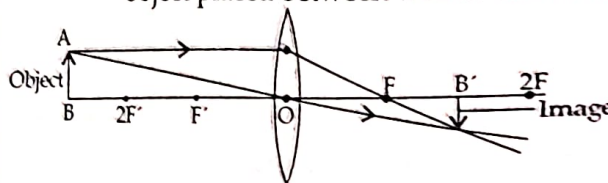


Q.6. The nature, size and position of image of an object produced by a lens or mirror are as shown below. Identify the lens/mirror (X) used in each case and draw the corresponding complete ray diagram. (Size of the object is about half of the image)

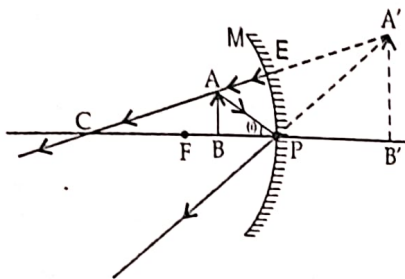
COMPETENCY



Ans. (a) In case 1, it is a convex lens with object placed between F and 2F.



(b) In case 2 it is a concave mirror with objects placed between focus and pole.



Q.7. (a) Calculate the distance at which an object should be placed in front of a convex lens of focal length 10 cm to obtain a virtual image of double its size.

(b) In the above given case, find the magnification, if image formed is real. Express it in terms of relation between ' v ' and ' u '. [CBSE 2016]

Ans. (a) $m = 2$, $f = 10$ cm

$$m = \frac{v}{u} \text{ or } v = mu = 2u$$

$$\text{Lens formula, } \frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\Rightarrow \frac{1}{10} = \frac{1}{2u} - \frac{1}{u} = \frac{-1}{2u}$$

$$\therefore u = -5 \text{ cm}$$

(b) The image formed is real then

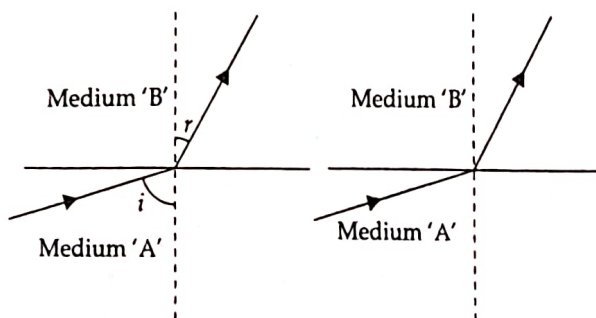
$$m = -2, \text{ hence } -2 = \frac{v}{u}; \quad v = -2u.$$

Q.8. A light ray enters from Medium A to Medium B as shown in the figure.

(a) Which one of the two media is denser w.r.t. other medium? Justify your opinion.

(b) If the speed of light in medium A is v_a , and in medium B is v_b , what is the refractive index of B with respect to A.

COMPETENCY



Ans. (a) Medium 'B' is denser than Medium 'A' because when a light ray goes from a rarer medium to a denser medium, it bends towards the normal, and $\angle r < \angle i$.

(b) We have the speed of light in medium A = v_a and the speed of light in medium B = v_b .

Hence, the refractive index of B with respect to A, ${}_A n_B = \frac{v_a}{v_b}$.

Q.9. An object is kept at a distance of 1 m from a lens of power +2D:

(a) Identify the type of lens.

(b) Calculate its focal length and distance of the image formed.

[CBSE 2023]

Ans. We have, $u = 1$, $m = -100$ cm

$$P = +2$$

(a) It is a convex lens because P has + sign.

(b) Formula, $f = \frac{1}{P}$

$$f = \left(\frac{1}{2}\right) \times 100 \text{ cm} = +50 \text{ cm}$$

Lens formula,

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\Rightarrow \frac{1}{v} - \left(\frac{1}{-100}\right) = \frac{1}{+50} \Rightarrow \frac{1}{v} + \frac{1}{100} = \frac{1}{50}$$

$$\Rightarrow \frac{1}{v} = \frac{1}{50} - \frac{1}{100}$$

$$\Rightarrow \frac{1}{v} = \frac{2-1}{100} = \frac{1}{100} \quad \therefore v = 100 \text{ cm.}$$

Q.10. An object of height 10 cm is placed 25 cm away from the optical centre of a converging lens of focal length 15 cm. Calculate the image-distance and height of the image formed.

[CBSE 2020]

Ans. Object distance (u) = -25 cm

Object height (h) = +10 cm

Focal length (f) = +15 cm

$$\text{Lens formula, } \frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{v} - \frac{1}{-25} = \frac{1}{-15} \Rightarrow \frac{1}{v} + \frac{1}{25} = \frac{1}{-15}$$

$$\Rightarrow v = +37.5 \text{ cm}$$

The image formed by convex lens is real and 37.5 cm away from the convex lens.

$$\text{Now, } \frac{h_2}{h_1} = \frac{v}{u}$$

$$\Rightarrow \frac{h_2}{+10} = \frac{75}{2} \times \frac{1}{-25} \Rightarrow h_2 = \left(75 \times \frac{10}{50} \right)$$

$$\Rightarrow h_2 = -15 \text{ cm}$$

The height of the image is 15 cm and the image is inverted.

(DAY 14)

Long Answer Questions

Q.1. It is desired to obtain an erect image of an object, using concave mirror of focal length of 12 cm.

(a) What should be the range of distance of an object placed in front of the mirror?

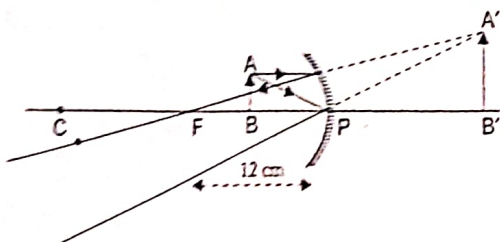
(b) Will the image be smaller or larger than the object. Draw ray diagram to show the formation of image in this case.

(c) Where will the image of this object be, if it is placed 24 cm in front of the mirror? Draw ray diagram for this situation also to justify your answer. Show the positions of pole, principal focus and the centre of curvature in the above ray diagrams.

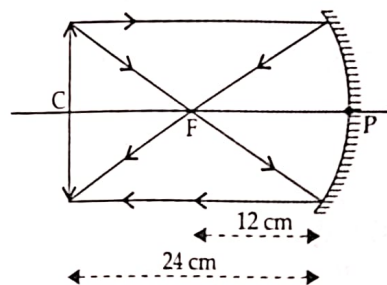
[CBSE 2016]

Ans. (a) The range of distance of an object placed in front of the mirror should be 0 cm to < 12 cm.

(b) Image will be larger than the object.



(c) Image will be 24 cm in front of the mirror.



Q.2. A spherical mirror produces an image of magnification -1 on a screen placed at a distance of 50 cm from the mirror.

(a) Write the type of mirror.

(b) Find the distance of the image from the object. What is the focal length of the mirror?

(c) Draw a ray diagram to show the image formation in this case.

[CBSE 2014]

Ans. Given. $m = -1$

$$v = 50 \text{ cm}$$

The image is real and inverted because the magnification has minus sign.

$$v = -50$$

$$\text{Formula: } m = \frac{-v}{u}$$

$$\Rightarrow -1 = \frac{-(-50)}{u}$$

$$\therefore u = -50 \text{ cm}$$

(a) Since image is formed on the screen, it is concave mirror.

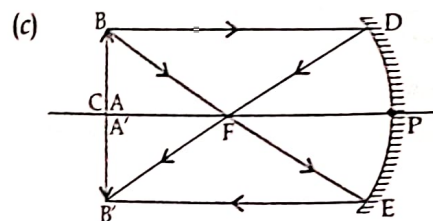
(b) Image distance = 50 cm in front of mirror.

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

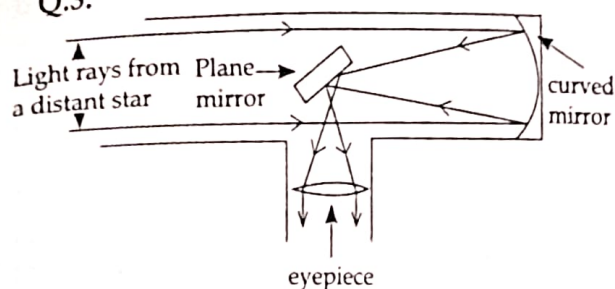
$$\Rightarrow \frac{1}{f} = \frac{1}{(-50)} + \frac{1}{(-50)} \Rightarrow \frac{1}{f} = -\frac{1}{50} - \frac{1}{50}$$

$$\Rightarrow \frac{1}{f} = -\frac{1+1}{50} = -\frac{2}{50} = -\frac{1}{25}$$

$$\therefore f = -25 \text{ cm}$$



Q.3.



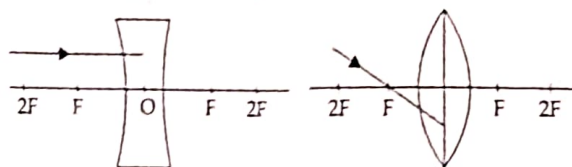
The above image is that of a reflecting telescope. Reflecting telescopes revolutionised our ways of looking into the sky. They employ mirrors to gather and focus light, rather than relying solely on lenses as in their refracting counterparts. These telescopes utilise precisely shaped and polished mirrors to capture incoming light and reflect it to a focal point, where it forms an image for observation.

- What kind of image of the star is seen by the observer at the eyepiece?
- What kind of mirror is used in this reflecting telescope?
- Explain with reason what kind of optical device (type of lens or mirror) that is used at the eyepiece.
- What is the role of the plane mirror in the telescope?

- Ans. A. Real Image as the final image is formed due to the lens at the eyepiece.
- B. Concave Mirror
- C. A converging lens is used at the eyepiece to collect the rays from the plane mirror and help the viewer to see a real erect image of the star.
- D. The plane mirror laterally inverts the image formed by the curved mirror and its position helps to direct the rays towards the eye-piece.

Q.4. (a) The refractive index of diamond is 2.42. What is the meaning of this statement?

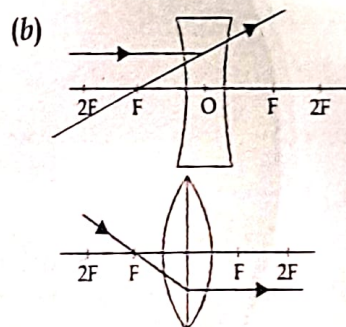
(b) Redraw the diagram given below in your answer book and complete the path of ray.



- What is the difference between virtual image produced by concave, plane and convex mirrors?
- What does the negative sign in the value of magnification produced by a mirror indicates about a image?

COMPETENCY

Ans. (a) The refractive index of diamond is 2.42, which means that the ratio of the speed of light in diamond to the speed of light in air is 2.42.



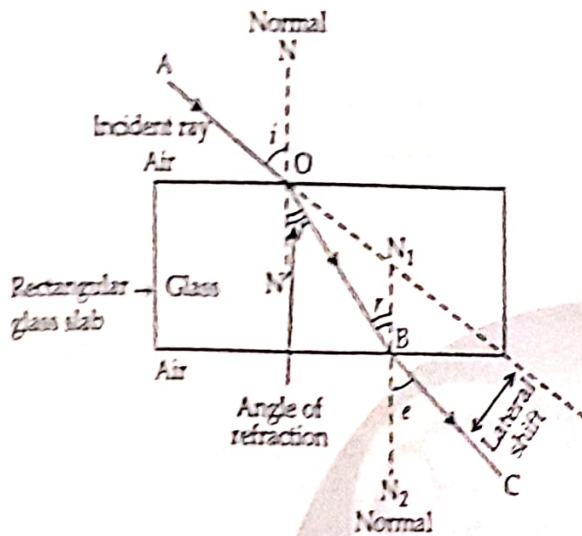
- The difference between virtual images produced by concave, plane and convex mirror is that –
 - Concave mirrors: Virtual images are always magnified.
 - Plane mirror: Virtual image is of the same size.
 - Convex mirror: Virtual images are diminished.
- The negative sign in the value of magnification produced by a mirror indicates an image that indicates that the image is real.

Q.5. (a) Draw a ray diagram to show the refraction of light through a glass slab and mark angle of refraction and the lateral shift suffered by the ray of light while passing through the slab.

[CBSE 2024]

- (b) If the refractive index of glass for light going from air to glass is $\frac{3}{2}$, find the refractive index of air for light going from glass to air. [CBSE 2024]

Ans. (a) Diagram.



- (b) Refractive index of glass from air

$$({}_a n_g) = \frac{3}{2}$$

Refractive index of air from glass

$$({}_g n_a) = \frac{1}{{}_a n_g} = \frac{1}{\frac{3}{2}} = \frac{2}{3}$$

- Q.6. (a) State the laws of refraction of light. Explain the term absolute refractive index of a medium and write an expression to relate it with the speed of light in vacuum. Express it mathematically. How is the refractive index of any medium 'A' with respect to a medium 'B' related to the speed of propagation of light in two media A and B? State the name of this constant when one medium is vacuum or air.

- (b) The absolute refractive indices of two media 'A' and 'B' are 2.0 and 1.5 respectively. If the speed of light in medium 'B' is 2×10^8 m/s, calculate the speed of light in:
(i) vacuum, (ii) medium 'A'.

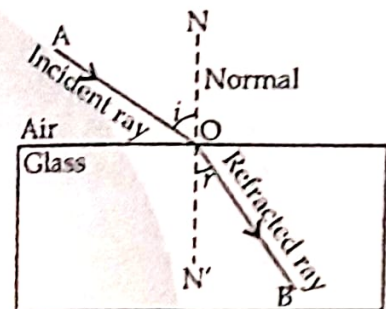
[CBSE 2015, 18]

Ans. (a) (i) The incident ray, the refracted ray, and the normal to the interface of two transparent media at the point of incidence all lie in the same plane.

- (ii) The ratio of the sine of the angle of incidence to the sine of the angle of refraction is a constant for the light of a given color and for the given pair of media.

$$\frac{\sin i}{\sin r} = \text{Constant}$$

This constant is called the refractive index of the medium.



When light travels from vacuum to another medium, the value of the refractive index is referred to as the absolute refractive index.

The absolute refractive index of a medium is defined as the ratio of the speed of light in a vacuum to the speed of light in that medium. In other words:

$$\text{Absolute Refractive Index (of a medium)} = \frac{\text{Speed of light in a vacuum (c)}}{\text{Speed of light in the medium (v)}}$$

The refractive index of medium 'A' with respect to medium 'B' is equal to the ratio of the speed of light in medium 'B' to the speed of light in medium 'A'. This can be expressed as:

$${}_A n_B = \frac{\text{Speed of light in medium B}}{\text{Speed of light in medium A}}$$

$${}_A n_A = \frac{v_B}{v_A}$$

- (b) Given, $n_A = 2.0$; $n_B = 1.5$

$$v_B = 2 \times 10^8 \text{ m/s}$$

$$(i) n_B = 1.5 = \frac{c}{v_B}$$

$$c = n_B v_B = 1.5 \times 2 \times 10^8 \text{ m/s} \\ = 3 \times 10^8 \text{ m/s}$$

(ii) For medium 'A' :

$$n_A = \frac{c}{v_A}$$

$$v_A = \frac{c}{n_A}$$

$$= \frac{3 \times 10^8 \text{ m/s}}{2}$$

$$= 1.5 \times 10^8 \text{ m/s}$$

Q.7. A convex lens forms a real and inverted image of a needle at a distance of 50 cm from it. Where is the needle placed in front of the convex lens if the image is equal to the size of the object? Also, find the power of the lens.

[NCERT, CBSE 2016]

Ans. Image distance = +50 cm

$$v = 50 \text{ cm}$$

$$m = 1$$

$$\text{Formula, } m = \frac{v}{u}$$

$$1 = \frac{v}{u}$$

$$\Rightarrow v = u$$

$$\therefore u = -50 \text{ cm}$$

Object distance = 50 cm

$$\text{Lens formula, } \frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{50} - \left(\frac{1}{-50} \right) = \frac{1}{f}$$

$$\Rightarrow \frac{1+1}{50} = \frac{1}{f}$$

$$\Rightarrow f = 25 \text{ cm}$$

$$\therefore P = \frac{1}{f} = \frac{1}{(25/100)\text{m}}$$

$$= \frac{1}{\frac{1}{4}} = 4 \text{ dioptre}$$

Q.8. An object is placed at a distance of 60 cm from a concave lens of focal length 30 cm.

(i) Use lens formula to find the distance of the image from the lens.

(ii) List four characteristics of the image (nature, position, size, erect/inverted) formed by the lens in this case.

(iii) Draw ray diagram to justify your answer of part (ii).

COMPETENCY

Ans. (i) $f = 30 \text{ cm}$; $u = -60 \text{ cm}$

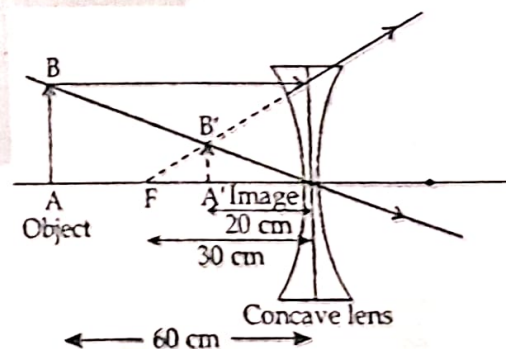
$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \quad \Rightarrow \quad \frac{1}{-30} = \frac{1}{v} - \frac{1}{-60}$$

$$\frac{1}{v} = -\left(\frac{1}{30} \right) - \frac{1}{60} \quad \Rightarrow \quad \frac{1}{v} = -\left(\frac{3}{60} \right)$$

$$\therefore v = -20$$

(ii) Nature is virtual, size is diminished, image is erect and position is 20 cm from lens, same side as the object.

(iii)



CASE BASED QUESTIONS

Q.1. A student took three concave mirrors of different focal lengths and performed the experiment to see the image formation by placing an object at different distances with these mirrors as shown in the following table.

Case No.	Object-distance	Focal length
I	45 cm	20 cm
II	30 cm	15 cm
III	20 cm	30 cm

Now answer the following questions:

[CBSE 2023]

- List two properties of the image formed in Case I.
- In which one of the cases given in the table, the mirror will form a real image of the same size and why?
- Name the type of mirror used by dentists. Give reason why do they use such type of mirrors.

COMPETENCY

Ans. (a) Focal length = 20 cm

Object distance = 45 cm

Hence, $C = F \times 2 = 20 \times 2 = 40$ cm

Object is placed beyond C.

Characteristic of the image.

- Real
- Diminished
- Inverted
- Between F and C

- In Case II the image will be formed real and of the same size as the object. As in this case,

$F = 15$ cm, $u = 30$ cm

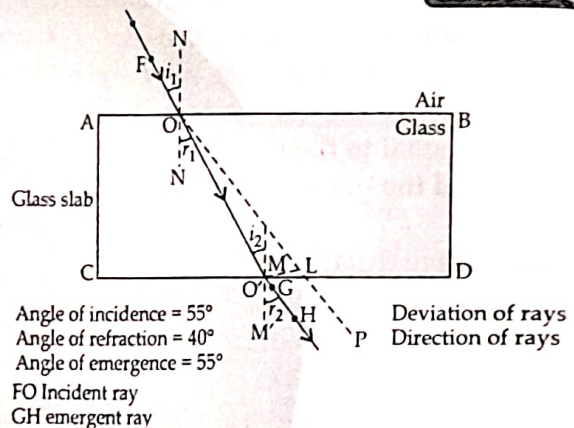
Hence $C = 30$ cm

Since an object is placed at C in front of a concave mirror, then the image formed is at C, Real, inverted and the same size of the object

- Concave mirrors are used by dentists to see the large images of the teeth of patients because when a tooth is within the focus of a concave mirror, then an enlarged image of the tooth is seen in the concave mirror. So it becomes easier to locate the defect in the tooth.

Q.2. The ability of a medium to refract light is expressed in terms of its optical density. Optical density has a definite connotation. It is not the same as mass density. On comparing two media, the one with the large refractive index is optically denser than the other. The other medium with a lower refractive index is optically rarer. Also the speed of light through a given medium is inversely proportional to its optical density.

COMPETENCY



- Determine the speed of light in diamond if the refractive index of diamond with respect to vacuum is 2.42. Speed of light in vacuum is 3×10^8 m/s.

- Refractive indices of glass, water and carbon disulphide are 1.5, 1.33 and 1.62 respectively. If a ray of light is incident in these media at the same angle (say θ), then write the increasing order of the angle of refraction in these media. $n_g = 1.5$, $n_w = 1.33$ and $n_{cs2} = 1.62$.

- The speed of light in glass is 2×10^8 m/s and in water is 2.25×10^8 m/s.

(i) Which one of the two is optically denser and why?

(ii) A ray of light is incident normally at the water-glass interface when it enters a thick glass container filled

with water. What will happen to the path of the ray after entering the glass? Give reason.

Ans. (a) Refractive index of diamond w.r.t. vacuum, $n_2 = 2.42$

Speed of light in vacuum
 $= 3 \times 10^8 \text{ m/s}$

Let speed of light in vacuum be v_1

Speed of light in diamond $= v_2$

$$n = \frac{\text{Speed of light in vacuum}}{\text{Speed of light in diamond}}$$

$$\Rightarrow 2.42 = \frac{3 \times 10^8}{v_2}$$

$$\therefore v_2 = \frac{3 \times 10^8}{2.42 \text{ m/s}} \\ = 1.24 \times 10^8 \text{ m/s}$$

(b) The higher the refractive index of a substance, the more it will change the direction (or bending towards the mirror) of a beam of light passing through it. Increasing order of angle

of refraction in media: Carbon disulphide (1.62) < Glass (1.5) < Water (1.33).

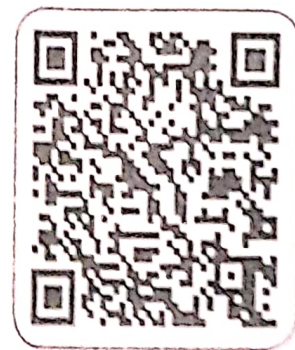
(c) (i) Speed of light in glass, $V_g = 2 \times 10^8 \text{ m/s}$ Speed of light in water, $V_w = 2.25 \times 10^8 \text{ m/s}$ Glass is optically denser than water because speed of light decreases as the optical density of a medium increases.

(ii) When a ray of light is incident normally then it goes straight (or normally) in the other medium (i.e., glass) because the incident ray goes along the normal to the surface, the angle of incidence in this case is zero (0) and the angle of refraction is also zero (0).

(DAY 14 SWAHA)



Available On
amazon



7

The Human Eye



What did CBSE ask last year?

MCQs & A/R	No Questions asked
Subjective	2 Very Short Questions ($2 \times 2 = 4$ Marks)
	1 Short Question ($1 \times 3 = 3$ marks)
	No Long Questions asked
Case Based	No Questions Asked

Note: All the above typology of questions include 'Competency based questions' labelled as

COMPETENCY

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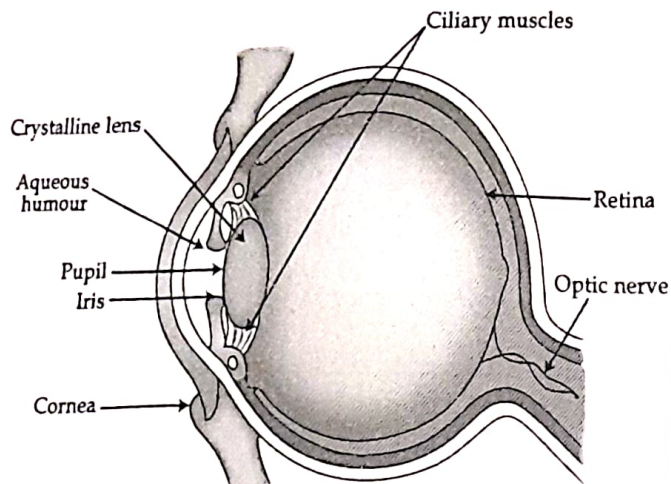
Scan this for
App Store and
Web users



The Human Eye

☐ Power of Accommodation

(Diagrammatic questions on the parts of eye come frequently)

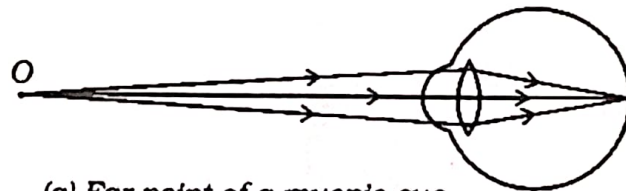


The Human eye

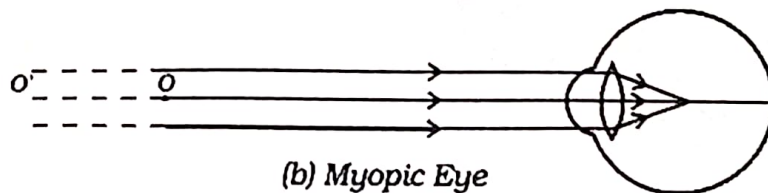
Defects of vision and their correction

- ☐ Myopia
- ☐ Hypermetropia
- ☐ Presbyopia

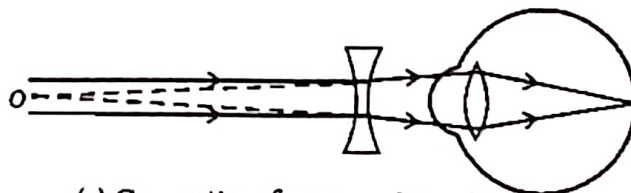
(CBSE loves to ask the corrective measures of each of these defects with basic formula based numericals)



(a) Far point of a myopic eye

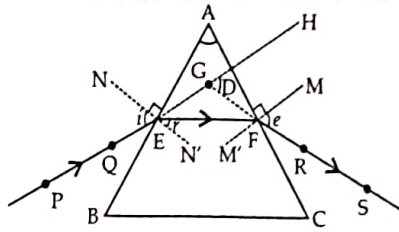


(b) Myopic Eye



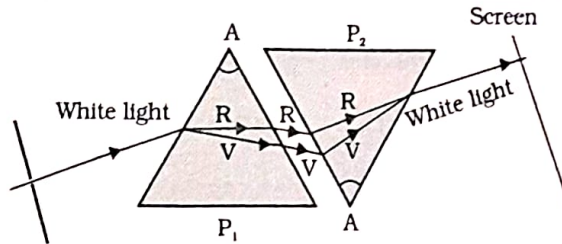
(c) Correction for myopia

Refraction of Light through a prism



Dispersion of white light by a glass prism

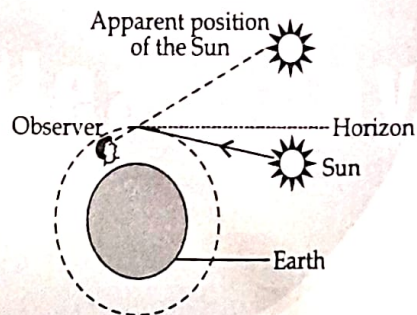
(Questions revolve around the recombination of spectrum of white light)



Atmospheric Refraction

- ☐ Twinkling of stars
- ☐ Advanced sunrise & delayed sunset

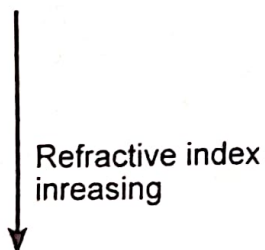
(Very short and short questions revolve around the reasons of these phenomena)



Scattering of Light

- ☐ Tyndall Effect
- ☐ Why is the sky blue?

(CBSE loves to ask the reasons & explanation of these phenomena)



OBJECTIVE QUESTIONS

(DAY 15)

Multiple Choice Questions

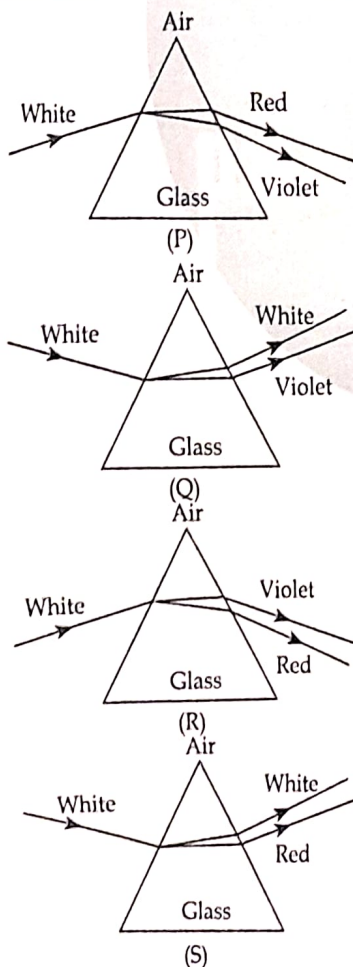
Q.1. The Sun appears red during sunset because _____.

COMPETENCY

- (a) of the refraction of the sunlight by the atmosphere.
- (b) the intensity of light reaching the Earth decreases in the evening.
- (c) most of the blue light is scattered away by the atmospheric particles near the horizon.
- (d) light is scattered to a greater extent in the evening due to a slight decrease in temperature.

Q.2. The path of light rays passing through a glass prism is BEST represented by _____.

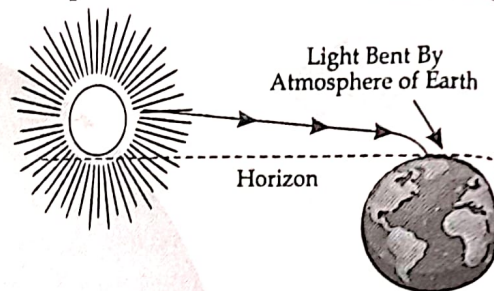
COMPETENCY



- (a) Only P
- (b) Only R
- (c) Either Q or S
- (d) Either P or R

Q.3. When light from the Sun enters the Earth's atmosphere it gets refracted. This will cause an apparent image of the Sun to appear in the sky due to refraction. The image below shows how light gets bent by the Earth's atmosphere.

COMPETENCY

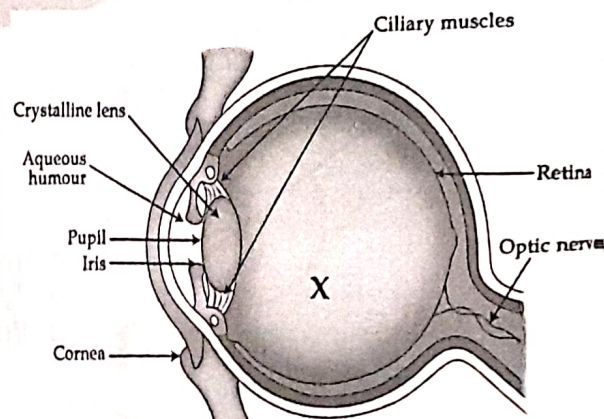


Which of the following would be an effect of this?

- (a) The sky appears to be blue in colour
- (b) It is much cooler early in the morning and late in the evening.
- (c) At sunrise, the Sun is seen in the sky even though it is still below the horizon.
- (d) The length of daylight increases during summer and decreases during winter time.

Q.4. Identify the 'X' in the following diagram

COMPETENCY



The Human eye

- (a) Vitreous humour
- (b) Optic nerve

(c) Pupil

(d) Iris

Q.5. When light rays enter the eye, most of the refraction occurs at the **COMPETENCY**

(a) crystalline lens

(b) outer surface of the cornea

(c) iris

(d) pupil

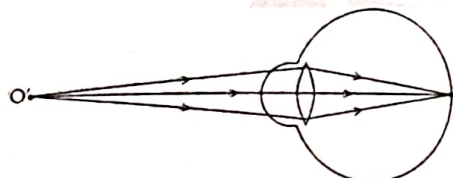
Q.6. A person with a myopic eye cannot see objects beyond 1.2 m distinctly. What should be the type of the corrective lens used to restore proper vision?

(a) Convex lens (b) Concave lens

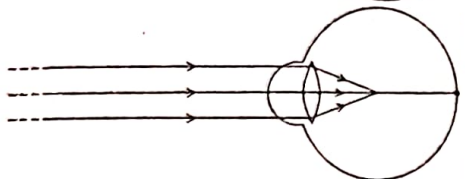
(c) Bi - focal lens (d) None of these

Q.7. Which of the following diagrams shows the hypermetropic eye? **COMPETENCY**

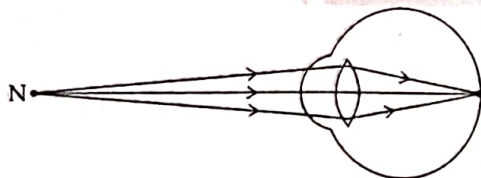
(a)



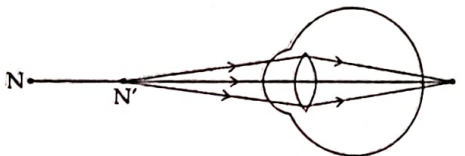
(b)



(c)



(d)

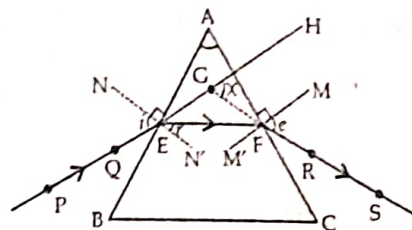


Q.8. A student has difficulty in reading the blackboard while sitting in the last row. What could be the defect the child is suffering from? **COMPETENCY**

(a) Presbyopia (b) Hypermetropia

(c) Myopia (d) Cancer

Q.9. Identify the angle 'X' in the following diagram



(a) Angle of prism

(b) Angle of emergence

(c) Angle of deviation

(d) Angle of incidence

Q.10. The phenomena of light involved in the formation of rainbows are

[CBSE 2023]

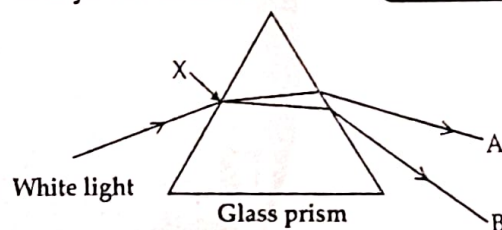
(a) Refraction, dispersion and scattering.

(b) Refraction, reflection and dispersion

(c) Refraction, dispersion and internal reflection.

(d) Reflection, dispersion and total internal reflection

Q.11. Choose the correct option for the colour of rays for A and B. **COMPETENCY**



	Colour of Ray A	Colour of Ray B
(a)	Blue	Red
(b)	Green	Yellow
(c)	Red	Violet
(d)	Violet	Indigo

Q.12. If dispersed light passes through an inverted prism, then the colour of the light becomes?

(a) Red

(b) White

(c) Blue

(d) Orange

Q.13. During the formation of rainbows, the refraction of light takes place

(a) Once

(b) Twice

(c) Thrice

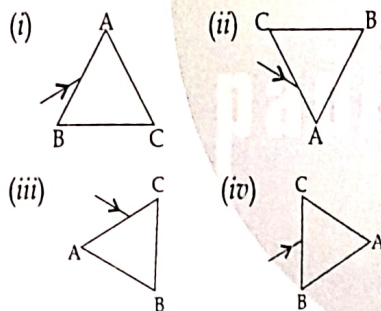
(d) Zero

Q.14. The face of the moon that is visible to us is called as the near-side and the face of the moon which is invisible to us is called as far-side.

What colour would the sky appear to an astronaut standing on the far-side of the Moon and why? **COMPETENCY**

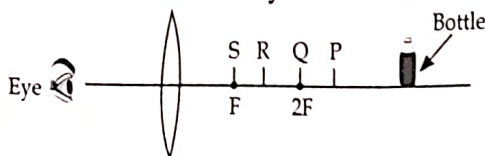
- (a) blue, as the Moon's atmosphere scatters sunlight just like Earth.
- (b) white, as the Moon's surface reflects all the light that falls on it.
- (c) black, as there is no atmosphere on Moon to scatter sunlight.
- (d) black, as sunlight does not fall on the far side of the Moon.

Q.15. A prism ABC (with BC as base) is placed in different orientations. A narrow beam of white light is incident on the prism as shown in below Figure. In which of the following diagrams, after dispersion, the third colour from the top of the spectrum corresponds to the colour of the sky? **COMPETENCY**



- A. (i)
- B. (ii)
- C. (iii)
- D. (iv)

16. A bottle is viewed through a convex lens as shown below. The bottle appears inverted at first. The bottle is now moved slowly towards the lens.



At which of the marked points will the image appear upright? **COMPETENCY**

- (a) P
- (b) Q
- (c) R
- (d) S

Q.17. Diabetic retinopathy causes damage to blood vessels in the retina. **COMPETENCY** Which of the following would NOT happen in a person having diabetic retinopathy?

- (a) Focussing on objects at different distances.
- (b) Formation of a clear image of the object.
- (c) Change in the size of the pupil.
- (d) Entry of light into the eye.

Q.18. The clear sky appears blue because **COMPETENCY**

- (a) blue light gets absorbed in the atmosphere
- (b) ultraviolet radiations are absorbed in the atmosphere
- (c) violet and blue lights get scattered more than lights of all other colours by the atmosphere
- (d) light of all other colours is scattered more than the violet and blue colours by the atmosphere

Q.19. Which of the following statements is correct regarding the propagation of light of different colours of white light in air? **COMPETENCY**

- (a) Red light moves fastest
- (b) Blue light moves faster than green light
- (c) All the colours of the white light move with the same speed
- (d) Yellow light moves with the same speed as that of the red and the violet light

Q.20. The danger signals installed at the top of tall buildings are red in colour. These can be easily seen from a distance because among all other colours, the red light **COMPETENCY**

- (a) is scattered the most by smoke or fog.
- (b) is scattered the least by smoke or fog.
- (c) is absorbed the most by smoke or fog.
- (d) moves fastest in air.

— Assertion Reason Questions —

Following questions consist of two statements: Assertion (A) and Reason (R).

Answer these questions selecting the appropriate option given below:

- (a) Both A and R are true, and R is the correct explanation of A.
- (b) Both A and R are true, R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

Q.1. Assertion: Just like a camera, human eye also has a lens.

Reason: The light-sensitive screen in human eye is called retina.

Q.2. Assertion: The focal length of human eye lens can be adjusted.

Reason: The ciliary muscles help to change the focal length of eye lens

Q.3. Assertion: The ability of the eye lens to adjust its focal length is called accommodation.

Reason: A normal eye can see objects clearly that are between 25 m and infinity

COMPETENCY

Q.4. Assertion: A person with myopia defect cannot see nearby objects clearly.

Reason: Myopia can be corrected by using a concave lens of suitable power.

Q.5. Assertion: Eyes must be removed within 4-6 hours after death for corneal transplantation.

Reason: Eye removal takes only 4-6 hours.

COMPETENCY

Q.6. Assertion: The splitting of light into its constituent colours is called dispersion.

Reason: Rainbow is formed due to dispersion of light

Q.7. Assertion: VIBGYOR stands for Violet, Indigo, Blue, Green, Yellow, Orange and Red.

Reason: A rainbow is always formed in a direction opposite to that of the Sun. The water droplets act like small prisms.

Q.8. Assertion. Stars appear twinkling due to atmospheric refraction of starlight.

Reason. Atmospheric refraction is also responsible for advanced sunrise.

Q.9. Assertion. The phenomenon of scattering of light by the colloidal particles gives rise to Tyndall effect.

Reason. Very fine particles scatter mainly blue light while particles of larger size scatter light of longer wavelengths.

Q.10. Assertion: The molecules of air and other fine particles in the atmosphere have size smaller than the wavelength of visible light.

Reason: The red light has a wavelength about 3 times greater than blue.

ANSWERS

— Multiple Choice Answers —

1. (c) 2. (a) 3. (c)

4. (a)

FREE ADVICE. Function of vitreous humour: "It aids in preserving the spherical form of the eye and can additionally enhance vision clarity and shock absorption."

5. (b)

6. (b) **Explanation.** Remember that concave lens is used to correct myopia, and convex lens is used in case of hypermetropia.

7. (d)

8. (c)

FREE ADVICE. If one is unable to read something placed at far distance, he's suffering from myopia, whereas if he suffers in reading something nearer to him, he's probably suffering from hypermetropia.

9. (c) 10. (d)

11. (c) Colour of Ray A is red as red light has maximum wavelength and colour of Ray B is violet as violet light has minimum wavelength.

12. (b)

13. (b) **Explanation.** A rainbow is a natural spectrum appearing in the sky after a rain shower. It is caused by dispersion of sunlight by tiny water droplets, present in the atmosphere. A rainbow is always formed in a direction opposite to that of the Sun. The water droplets act like small prisms. They refract and disperse the incident sunlight, then reflect it internally, and finally refract it again when it comes out of the raindrop. Due to the dispersion of light and internal reflection, different colours reach the observer's eye.

14. (c) 15. (b) 16. (d) 17. (b)
18. (c) 19. (c) 20. (b)

Assertion-Reason Answers

- (b) Both A and R are true, and R is not the correct explanation of A.
- (a) Both A and R are true, and R is the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.
- (c) A is true but R is false.
- (b) Both A and R are true, and R is not the correct explanation of A.
- (b) Both A and R are true, and R is not the correct explanation of A.
- (b) Both A and R are true, and R is not the correct explanation of A.
- (b) Both A and R are true, and R is not the correct explanation of A.
- (c) A is true but R is false.

SUBJECTIVE QUESTIONS

Very Short Answer Questions

Q.1. Name the condition resulting due to the eye lens becoming cloudy.

[CBSE 2010, 12, 17]

Ans. Cataract

Q.2. Write the structure of eye lens and State one role of ciliary muscles in the human eye.

[CBSE 2012, 19]

Ans. The structure of the eye lens is transparent and biconvex.

The function of the ciliary muscle in the human eye is to hold the crystalline lens and adjust the focal length according to the requirements for focusing on objects at various distances.

Q.3. Why is blind spot so called?

[CBSE 2024]

Ans. In the region of the blind spot, photoreceptors are not present, so an image is not formed in this region

Q.4. The far point of a myopic person is 80 cm in front of the eye. What is the nature and power of the lens required to correct the problem?

COMPETENCY

Ans. Formula: Power = $\frac{1}{\text{Far Point}}$

$$\therefore P = \frac{1}{80} = \frac{100}{80} \text{ cm} = -1.25 \text{ D}$$

The nature of the lens to correct the disease is concave lens and the power is -1.25 D.

Q.5. What kind of lens is used in the spectacles of a person suffering from myopia (near sightedness)?

[CBSE 2014]

Ans. A concave lens

Q.6. A person is advised to wear spectacles with concave lenses. What type of defect of the vision is he suffering from?

[CBSE 2012]

Ans. Myopia

Q.7. How can we see the spectrum of white light?

COMPETENCY

Ans. We can see the spectrum of white light by passing white light through a prism; it will disperse the white light into its constituent colors.

Q.8. Which colour of white light suffers

(a) least deviation and

(b) maximum deviation when a beam of white light passes through a glass prism?

[CBSE 2024]

Ans. (a) Red (b) Violet

Q.9. On what factor the colour of the scattered light depends? [CBSE 2014]

Ans. The colour of the scattered light depends on the size of the scattering particles.

Q.10. Why sky appears dark to the passengers flying at high altitudes?

[CBSE 2011, 12]

Ans. The sky appears dark to passengers flying at very high altitudes, as scattering is not prominent at such heights.

Q.11. What is meant by the power of accommodation of an eye? [CBSE 2011]

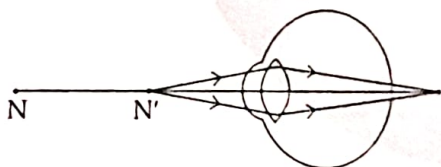
Ans. The power of the eye lens to adjust its focal length allows it to focus on distant objects as well as nearby objects.

Short Answer Questions

Q.1. A. What is the fundamental difference between hypermetropia and myopia in terms of the optical experience of a person?

B. The diagram below shows a special case of an eye defect.

- (i) What is the defect that is shown in the figure?
- (ii) State one cause for such a defect.
- (iii) Explain with reason if a concave lens can be used to correct the defect. [CBSE 2024]



Ans. A. Fundamental difference between hypermetropia and myopia.

Hypermetropia is a defect that causes difficulty in focusing on near objects, with clearer vision observed for distant objects. In Myopia distant objects appear blurry while near objects are seen clearly.

B. (i) The image shows a case of hypermetropia.

(ii) Cause of hypermetropia:

Shortening of the eyeball or focal length of the eyelens becomes too long.

(iii) We cannot use a convex lens to correct this defect, as concave lens would diverge the rays coming to the eyeball and will push the image even further. A convex lens should be used which will help to converge the rays and create the image at the exact place on the retina.

Q.2. State one function each of iris, pupil, and cornea. [CBSE 2014]

Ans. Iris: The iris controls the amount of light entering the eye by dilating and contracting the pupil.

Pupil: The pupil is the region of the eye through which light enters into the eye.

Cornea: The cornea refracts the light entering the eye.

Q.3. (a) A person is suffering from both myopia and hypermetropia.

(i) What kind of lenses can correct this defect?

(ii) How are these lenses prepared?

(b) A person needs a lens of power +3D for correcting his near vision and -3D for correcting his distant vision. Calculate the focal lengths of the lenses required to correct these defects. [CBSE 2024]

Ans. (a) (i) Bifocal lenses will help the person who is suffering from both myopia and hypermetropia.

(ii) Bifocal lenses are prepared in such a way that the upper parts of the lens are concave lenses, and the lower parts of the lens are convex lenses.

(b) $P_1 = +3D$

$$\therefore f_1 = \frac{1}{P_1} = \frac{1}{3} \text{ m} = \frac{100}{3} = +33.3 \text{ cm}$$

and $P_2 = -3$

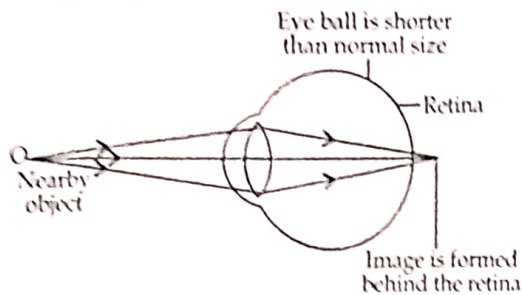
$$\therefore f_2 = \frac{1}{P_2} = \frac{1}{-3} = \frac{-100}{3} = -33.3 \text{ cm}$$

Q.4. A person cannot read newspaper placed nearer than 50 cm from his eyes. Name the defect of vision he is suffering from. Draw a ray diagram to illustrate

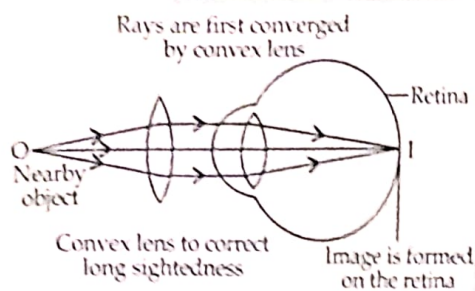
this defect. List its two possible causes. Draw a ray diagram to show how this defect may be corrected using a lens of appropriate focal length. [CBSE 2013]

Ans. If a person cannot read newspaper nearer than 50 cm from his eyes then he is suffering from hypermetropia. It is also called long-sightedness. Causes. The focal length of the eye is too long.

The eye ball has become too small
Ray diagram.



An eye suffering from long sightedness, far sightedness or hypermetropia. The image I of a nearby object O is formed behind the retina.



Long sightedness is corrected by using a convex lens.

Q.5. Sushil went to an eye specialist for check up. He prescribed him to use spectacle lens of +0.5D power.

- Name the defect of vision he is suffering from.
- Find the focal length of spectacle lens. [CBSE 2015]

Ans. (a) Hypermetropia
(b) Formula

$$f = \frac{1}{D}$$

$$\therefore f(m) = \frac{1}{0.5} = 2 \text{ m}$$

FREE ADVICE. In case it's asked to find out the focal length in 'cm', multiply the result by 100.

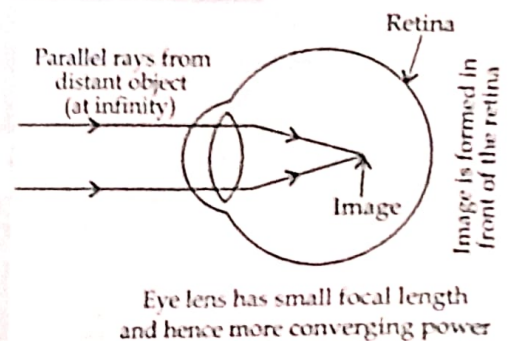
- Q.6. State reasons for Myopia. With the help of ray diagrams, show the
(a) image formation by a myopic eye, and
(b) correction of myopia using an appropriate lens. **COMPETENCY**

Ans. (a) A person with myopia can see nearby objects clearly but cannot see distant objects distinctly.

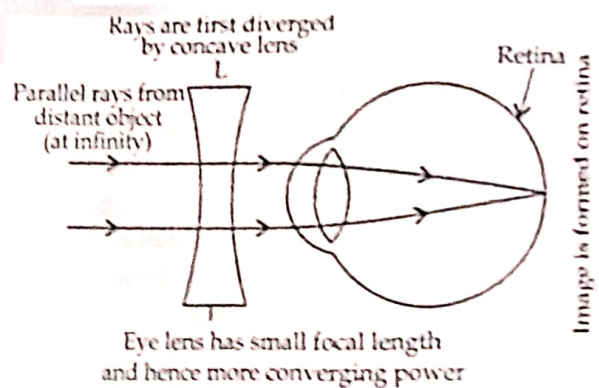
Causes. Due to the elongation of the eye ball Excessive curvature of the eye lens.

- Myopia can be corrected with the help of concave lens of suitable focal length.

Ray diagram:



Eye lens has small focal length and hence more converging power

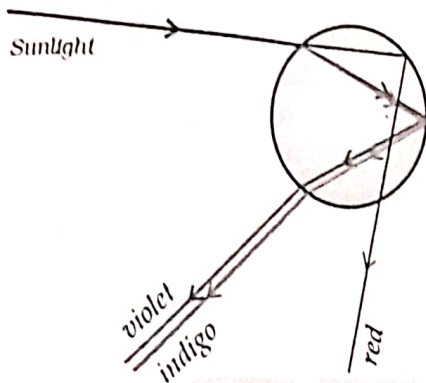


Q.7. What is rainbow? When and where do we see a rainbow? How is a rainbow formed? Draw a labelled diagram to illustrate the formation of a rainbow.

[CBSE 2013, 17, 19]

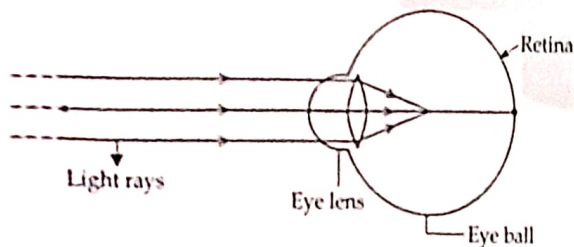
Ans. Rainbow is a natural phenomenon in which sunlight is dispersed into its constituent colour through tiny water droplets in the earth atmosphere.

It is caused by dispersion of sunlight by tiny water droplets, present in the atmosphere. A rainbow is always formed in a direction opposite to that of the Sun. The water droplets act like small prisms.



They refract and disperse the incident sunlight, then reflect it internally, and finally refract it again when it comes out of the raindrop (Figure). Due to the dispersion of light and internal reflection, different colours reach the observer's eye.

Q.8. Observe the following diagram and answer the questions following it:



- Identify the defect of vision shown.
- List its two causes.
- Name the type of lens used for the correction of this defect. **COMPETENCY**

Ans. (a) Myopia

(b) Causes.

- Due to elongation of the eye ball
- Excessive curvature of the eye ball

- (c) Concave lens is used for the correction of this defect.

(DAY 16)

— Long Answer Questions —

Q.1. A person is unable to see objects distinctly placed within 75 cm from his eyes.

- Name the defect of vision the person is suffering from.
- List its two possible causes.
- Calculate the power of the lens needed to correct this defect. Assume that the near point for the normal eye is 25 cm.

Ans. (a) Hypermetropia or long sightedness.

(b) Two possible causes:

- Curvature of eye lens decreases.
- Shortening of eye ball.

(c) Given. $u = -25$ cm,

$$v = -75 \text{ cm}, \quad f = ?$$

According to lens formula

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\Rightarrow \frac{1}{f} = \frac{1}{-75} + \frac{1}{25}$$

$$\Rightarrow \frac{1}{f} = \frac{-1+3}{75} = \frac{2}{75}$$

$$\therefore f = 37.5 \text{ cm}$$

$$\text{Now, } P = \frac{100}{f} = \frac{100}{37.5} = +2.67 \text{ D}$$

Q.2. A person cannot see the objects distinctly, when placed beyond 2 m.

- Identify the eye defect.
- Give two reasons for this defect.
- Calculate the power and nature of the lens he should be using to see the distant objects clearly.
- Draw the ray diagrams for the defective and the corrected eye.

[CBSE 2011, 13, 18]

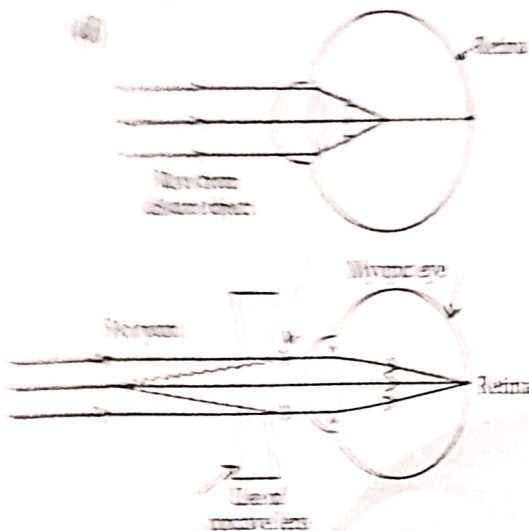
Ans. (a) Myopia

(b) (i) Excessive curvature of the eye lens

(ii) Elongation of eye ball

Q. Formula

$$P = \frac{1}{f} = \frac{1}{-0.5} = -2.0 \text{ D}$$



Q. List three common refractive defects of vision. Suggest the way of correcting these defects. [CBSE 2014]

Ans. The three defects of vision:

(a) **Myopia.** Myopia is the defect of the eye vision due to which a person can see the near objects but he cannot see the far objects clearly.

Causes of myopia. Myopia is caused due to the elongation of the eye ball and due to decrease in the focal length of the eye lens. The eye lens becomes more convergent.

Correction. Myopia can be corrected by using a concave lens of suitable focal length in the spectacles of such a person.

(b) **Long-sightedness or hypermetropia.** Due to this defect, a person is not able to see the nearby objects clearly but can see the distant objects clearly.

Causes of hypermetropia. It is caused due to the following reasons:

Normal increase in the focal length of the eye lens. The lens becomes less convergent.

Shortening of the eyeball size.

Correction. Long sightedness can be corrected by using a convex lens of suitable focal length in the spectacles of such a person. When a convex lens of suitable power is placed in front of the

hypermetropic eye then the diverging rays of light coming from the nearby object are first converged by this convex lens. Due to this, the convex lens forms a virtual image of the nearby object at a point near to the hypermetropic eye. Then the hypermetropic eye can easily focus the image formed by convex lens on the retina.

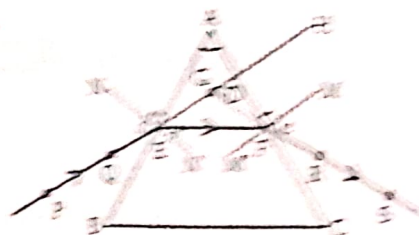
(c) **Presbyopia.** The power of accommodation of the eye decreases with aging because of the gradual weakening of the ciliary muscles and decreasing flexibility of the crystalline lens. The near point of the eye increases with age and may reach even 2 metres. This defect is called presbyopia. Causes of presbyopia. It is mainly caused due to the weakening of the ciliary muscles of the eyes. Such a person may suffer from myopia and hypermetropia.

Correction. This defect is then corrected by using bifocal lenses of suitable focal lengths. The upper part of the lens is a concave lens for correcting myopia to see the distant objects clearly, while the lower part of the lens has a convex lens to correct the hypermetropic to see the nearby objects clearly.

Q.4. Draw a ray diagram showing refraction of light through a glass prism and mark the following

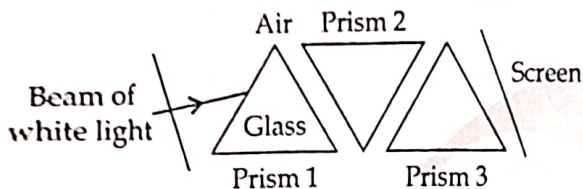
- Incident ray
- Emergent ray
- Refracted ray
- Angle of incidence
- Angle of deviation
- Angle of emergence

Ans.



PE - Incident ray
 EF - Refracted ray
 FS - Emergent ray
 $\angle A$ - Angle of the prism
 $\angle i$ - Angle of incidence
 $\angle r$ - Angle of refraction
 $\angle e$ - Angle of emergence
 $\angle D$ - Angle of deviation

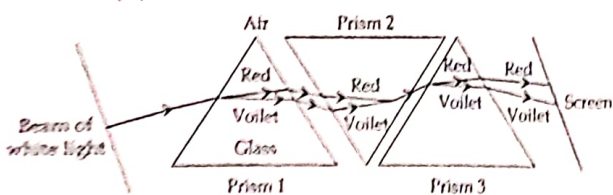
Q.5. Savera passed a beam of white light through a series of equilateral prisms as shown. **COMPETENCY**



- What colour(s) will be seen on the screen?
- Copy the diagram above and draw the beam entering Prism 1 and emerging from Prism 3 and falling on the screen.
- Name all the processes that take place when the beam of light enters the Prism 1 and emerges from Prism 3.

Ans. (a) When a white ray passes through prism 1, it disperses into seven colours. When again it passes through prism 2, it changes into a white ray. Now this white ray passes through prism 3, it deviates again into seven colours, it is known as VIBGYOR.

(b)



- (c) Name of Processes are
- Dispersion
 - Refraction

Q.6. What is atmospheric refraction? Use this phenomenon to explain the following natural events.

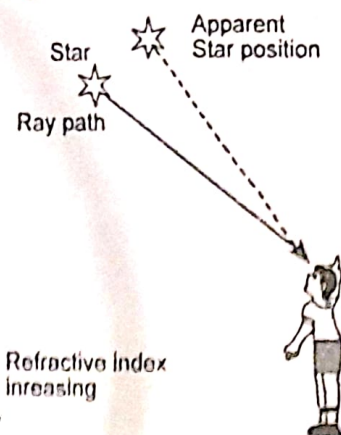
- Twinkling of stars
- Advanced sun-rise and delayed sun-set

Draw diagrams to illustrate your answers. [CBSE 2016]

Ans. Atmospheric Refraction: The bending of light as it passes through the Earth's atmosphere, which contains layers of air with differing optical densities, is termed atmospheric refraction.

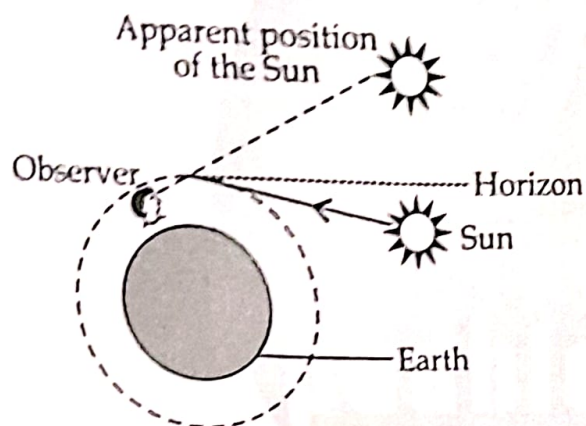
Twinkling of Stars: The twinkling of a star is a result of the atmospheric refraction of starlight. Atmospheric refraction takes place in a medium with a gradually changing refractive index. As the atmosphere bends starlight toward the normal, the star's apparent position differs slightly from its actual position.

This apparent position of the star is not constant, but experiences slight changes due to the ever-changing physical conditions of the Earth's atmosphere. Since stars are extremely distant, they behave as point-sized sources of light. Because the path of light rays from the star undergoes minor variations, the apparent position of the star fluctuates, causing fluctuations in the amount of light entering the eye. As a result, the star may appear brighter at times and fainter at other times, creating the twinkling effect.



Early sunrise and postponed sunset. The Sun becomes visible approximately two minutes prior to sunrise due to

As the Sun's position appears below the horizon. As the Sun's light travels from less dense air to more dense air within the atmosphere, it undergoes refraction, bending downward. Consequently, this atmospheric refraction creates the illusion of the Sun being elevated above the horizon, although it is actually just below it. Similarly, atmospheric refraction also enables us to continue observing the Sun for approximately two minutes after it has technically set below the horizon. During sunset, we perceive the apparent position of the Sun, which is a result of the bending of light rays. Therefore, atmospheric refraction extends the time from sunrise to sunset by approximately 4 minutes.

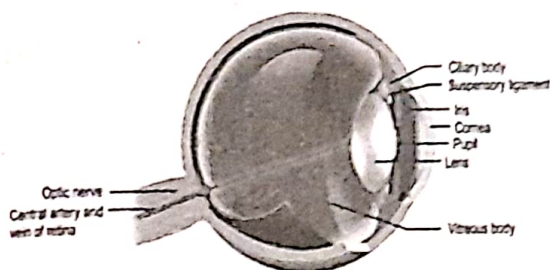


Q.7. What is Tyndall effect? What is the colour of the clear sky during daylight? Give reason for it.

Ans. The phenomenon in which a beam of light scatters is referred to as the Tyndall phenomenon. The Tyndall phenomenon becomes evident when sunlight passes through the dense foliage of a forest. Within a dense forest, mist contains minuscule water droplets that function as colloidal particles dispersed in the air. During daylight hours, the sky takes on a blue hue. This is due to the fact that the air molecules and other fine particles present in the atmosphere are small in size compared to the wavelength of visible light. Consequently, the particles scatter shorter wavelength light rays, primarily those at the blue end of the spectrum, more effectively than light with longer wavelengths, such as that at the red end. As a result, when the scattered blue light enters our eyes, it creates the perception of a blue sky.

CASE BASED QUESTIONS

Q.1. The iris is a muscular diaphragm that controls the size of the pupil. It consists of two layers: the front pigmented fibrovascular layer known as a stroma and, beneath the stroma, pigmented epithelial cells. The colour of the eye is defined by the pigmentation of the iris.

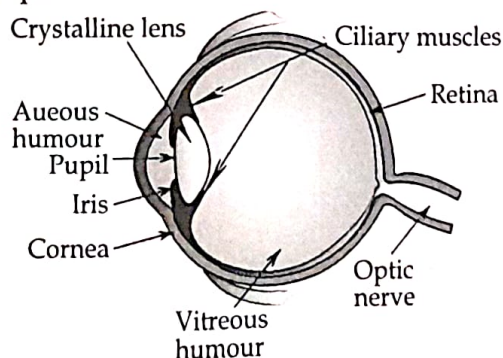


- Name the thin membrane through which light enters.
- Colour of eye is defined by which part of the eye.
- What is the function of pupil and write the nature of image formed on retina?

COMPETENCY

Ans. (a) Cornea
 (b) Colour of eye is defined by iris
 (c) Pupil regulates and controls the amount of light entering the eye and the nature of image formed on retina is inverted and real.

Q.2. In a human eye, the distance between the lens and the retina is 17 mm. The light entering the eye gets refracted at the cornea and then at the lens. Ciliary muscles in the eye can control the focal length of the lens by changing its shape.



(a) Diana is looking at the Moon. What is the focal length of the combination of cornea and the lens in Diana's eyes at this time?

(b) Diana is reading a book kept at a distance of 20 cm from her eyes. What is the focal length of the combination of the cornea and the lens in Diana's eyes at this time?

(c) When Diana brings the book closer to her eyes, the letters appear blurry to her and she cannot read the book. Explain why the letters appear blurry to her.

Ans. (a) 17 mm

(b) $v = 1.7$ cm; $u = 20$ cm

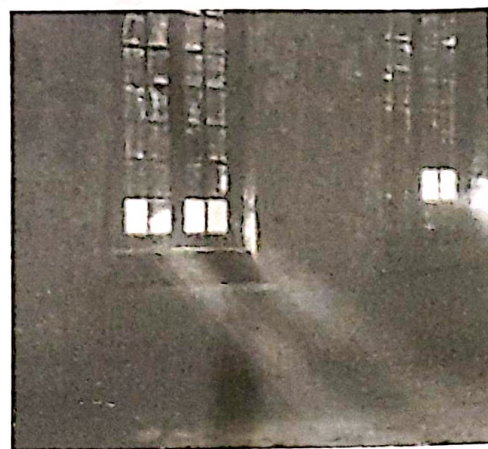
$$\text{Formula: } \frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\therefore \frac{1}{f} = \frac{1}{(-1.7)} - \frac{1}{(-20)} = 18.6 \text{ mm}$$

(c) Because the location of the image moves behind the retina

Q.3. Nanda saw rays of sunlight entering into a dark room as shown below.

He then did something to the air in the room after which he was NOT able to see the rays of sunlight in the room.



(a) What is it that Nanda could have done to make the rays of sunlight invisible? justify your answer.

(b) What colour does the Sun appear to the astronauts on International Space Station? Give reason. **COMPETENCY**

(c) How does the scattering of light depend on the size of the scattering particles. **COMPETENCY**

Ans. (a) Removing all the dust particles from the air in the room by passing the air through a very efficient filter.

(b) Since there is no medium to disperse or scatter the light coming from the Sun, it appears white.

on the size of the scattering particles. Very fine particles scatter mainly light while particles of larger size scatter light of longer wavelengths. If the size of the scattering particles is large enough, then, the scattered light even appear white.

(DAY 16 SWAHA)

* * * * *



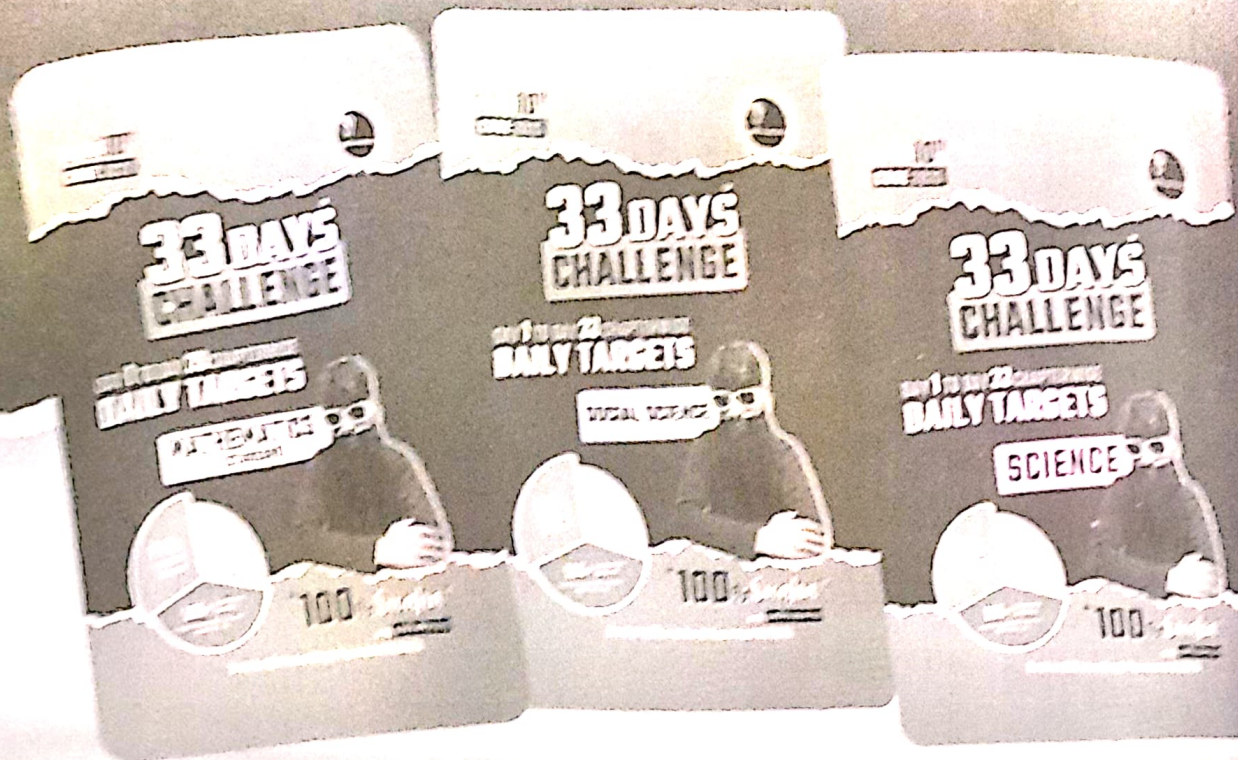
DAY 17

“Congratulate yourself on completing the half way of your 33 days journey. Share your experience with others via video review on ‘Amazon’ , ‘FlipKart’ , and ‘Instagram’—

@padhle.akshay.”

— Akshay Bhaiya





Available On
amazon



8

How do Organisms Reproduce?



What did CBSE ask last year?

MCQs & A/Rs	2 Questions ($2 \times 1 = 2$ Marks)
Subjective	1 Very Short Question ($1 \times 2 = 2$ Marks)
	No Short Questions asked
	1 Long Question ($1 \times 5 = 5$ Marks)
Case Based	1 Question ($1 + 1 + 2 = 4$ Marks)

Note: All the above typology of questions include 'Competency based Questions' labelled as

COMPETENCY

Scan this for
Play Store and
Android users



Scan this for
App Store and
Web users



Do organisms create exact copies of themselves?

☐ Introduction to 'cell' and 'DNA'

☐ The importance of variation

(very-short and short questions revolve around the importance of DNA replication and variation)

Asexual Reproduction

☐ Fission

☐ Fragmentation

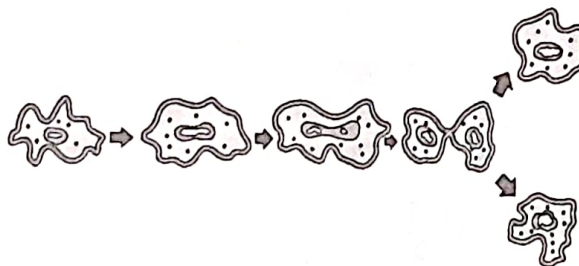
☐ Regeneration

☐ Budding

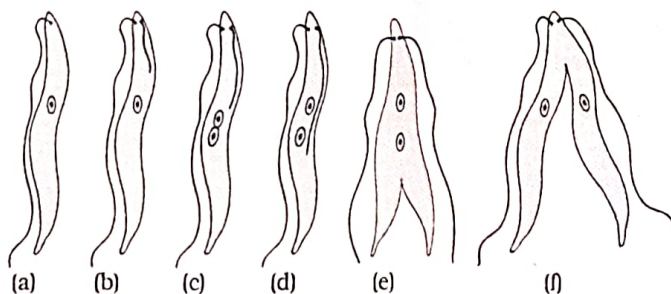
☐ Vegetative Propagation

☐ Spore Formation

(CBSE loves to ask advantages and disadvantages of any of these methods)



Figure(a) Binary fission in Amoeba



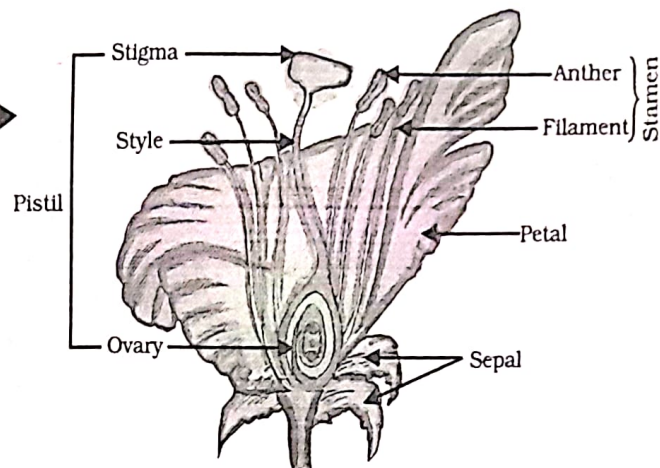
Figure(b) Binary fission in Leishmania

Sexual Reproduction

❑ Why sexual mode of reproduction?

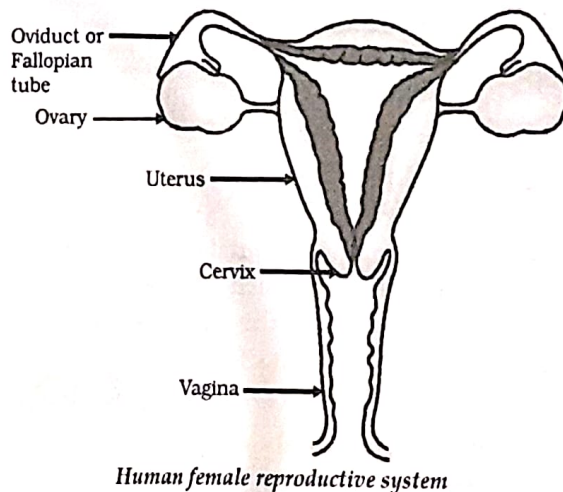
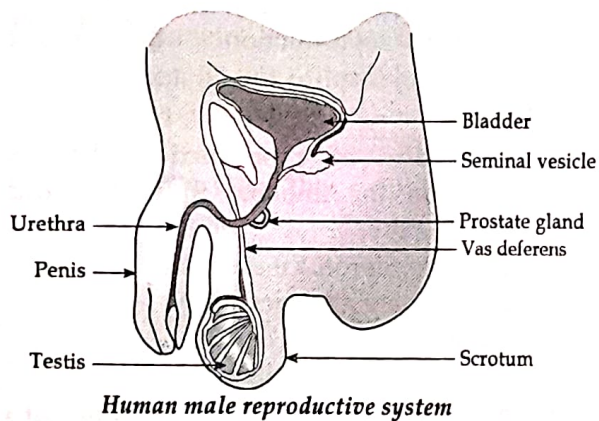
❑ Sexual reproduction in flowering plants

(Questions revolve around self pollination and cross pollination)



ORGANISMS DUCE?

❑ Reproduction in Human Beings



❑ Reproductive Health

(Short and long questions ask about menstrual cycle and the contraceptive methods)

OBJECTIVE QUESTIONS

(DAY 18)

Multiple Choice Questions

Q.1. Which one of the given statements is incorrect: [CBSE 2023]

- (a) DNA has the complete information for a particular characteristic.
- (b) DNA is the molecule responsible for the inheritance of characters from parents to off springs.
- (c) Change in information will produce a different protein.
- (d) Characteristics will remain the same even if protein change.

Q.2. Which of the following

useful to prevent
when ovulation

P. surgical bl
tube.

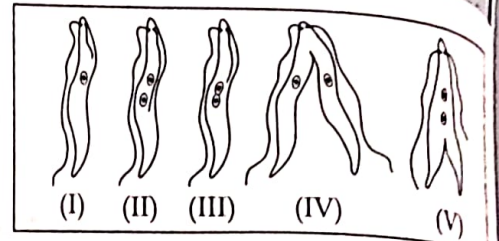
Q. copper

R. oral

S. co

(a)

(b)



(a) I,II,III,IV,V

(b) I,III,II,V,IV

(c) I,III,V,II,IV

(d) I,II,III,V,IV

Q.6. In the list of organisms given below, those that reproduce by the asexual method are [NCERT example]

(i) Banana

(ii) Dog

(iii) Yeast

(iv) Amoeba

tion occurs

ion

tion

multicellular

of a cell to divide in
several cells during reproduction
Plasmodium is called [NCERT example]

(a) budding

(b) reduction division

(c) binary fission

(d) multiple fission

order of the stages

in Leishmania

SHAY'S 33 DAYS CHALLENGE [Science-X]

Q.10. Factors responsible for the rapid spread of bread mould on slices of bread are

- (i) large number of spores.
- (ii) availability of moisture and nutrients in bread.
- (iii) presence of tubular branched hyphae.
- (iv) formation of round shaped sporangia.

- (a) (i) and (iii) (b) (ii) and (iv)
- (c) (i) and (ii) (d) (iii) and (iv)

Q.11. In Rhizopus, tubular thread-like structures bearing sporangia at their tips are called

- (a) filaments (b) hyphae
- (c) rhizoids (d) roots

Q.12. Which of the following is the correct sequence of events of sexual reproduction in a flower?

- (a) pollination, fertilisation, seedling, embryo
- (b) seedling, embryo, fertilisation, pollination
- (c) pollination, fertilisation, embryo, seedling
- (d) embryo, seedling, pollination, fertilisation

Q.13. The correct sequence of reproductive stages seen in flowering plants is

- (a) gametes, zygote, embryo, seedling
- (b) zygote, gametes, embryo, seedling
- (c) seedling, embryo, zygote, gametes
- (d) gametes, embryo, zygote, seedling

Q.14. Which of the following statements are true for flowers?

- (i) Flowers are always bisexual.
- (ii) They are the sexual reproductive organs.
- (iii) They are produced in all groups of plants.
- (iv) After fertilisation they give rise to fruits.

- (a) (i) and (iv) (b) (ii) and (iii)
- (c) (i) and (iii) (d) (ii) and (iv)

Q.15. Which among the following statements are true for unisexual flowers

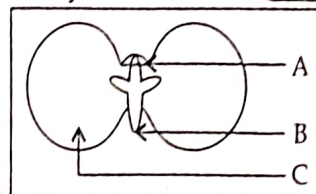
- (i) They possess both stamen and pistil.
- (ii) They possess either stamen or pistil.

(iii) They exhibit cross pollination.

(iv) Unisexual flowers possessing only stamens cannot produce fruits.

- (a) (i) and (iv)
- (b) (ii), (iii) and (iv) the given
- (c) (iii) and (iv)
- (d) only (iv)

Q.16. In Figure, the parts A, B and C are sequentially



- (a) cotyledon, plumule and radicle
- (b) plumule, radicle and cotyledon
- (c) plumule, cotyledon and radicle
- (d) radicle, cotyledon and plumule

Q.17. During adolescence, several changes occur in the human body.

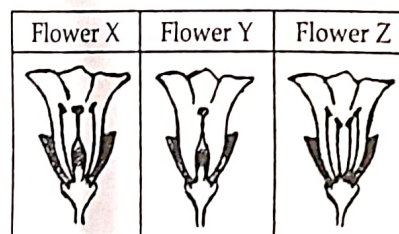
Mark one change associated with sexual maturation in boys.

- (a) loss of milk teeth
- (b) increase in height
- (c) cracking of voice
- (d) weight gain

Q.18. A certain class of herbicides does not allow pollen tube formation. Which of the following processes does it inhibit?

- (a) Cross-pollination
- (b) Self-pollination
- (c) Seed dispersal
- (d) Fertilisation

Q.19. Consider the following three flowers namely X, Y and Z. Which flower(s) would develop into a fruit?



- (a) X only (b) Z only
- (c) X and Y only (d) Y and Z only

Q.20. Which among the following is not the function of testes at puberty?

[CBSE 2024]

- (i) formation of germ cells
- (ii) secretion of testosterone
- (iii) development of placenta
- (iv) secretion of estrogen
- (a) (i) and (ii) (b) (ii) and (iii)
- (c) (iii) and (iv) (d) (i) and (iv)

Q.21. The correct sequence of organs in the male reproductive system for transport of sperms is

- (a) testes → vasdeferens → urethra
- (b) testes → ureter → urethra
- (c) testes → urethra → ureter
- (d) testes → vasdeferens → ureter

Q.22. Which among the following diseases is not sexually transmitted?

- (a) Syphilis (b) Hepatitis
- (c) HIV-AIDS (d) Gonorrhoea

Q.23. In human females, an event that reflects onset of reproductive phase is

- (a) growth of body
- (b) changes in hair pattern
- (c) change in voice
- (d) menstruation

Q.24. Which of the following contraceptive methods does not have side effects?

- (a) Pills
- (b) Copper-T
- (c) Surgical methods
- (d) None of these

Q.25. The waste substances produced by the embryo are removed by transferring them to the mother's blood with the help of what?

COMPETENCY

- (a) Vagina (b) Cervix
- (c) Uterus (d) Placenta

— Assertion Reason Questions —

Following questions consist of two statements: Assertion (A) and Reason (R).

Answer these questions selecting the appropriate option given below:

- (a) Both A and R are true, and R is the correct explanation of A.

(b) Both A and R are true, and R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

Q.1. Assertion: Variations always provide a survival advantage to an organism.
Reasons: Variations can be caused due to incorrect DNA copying.

COMPETENCY

Q.2. Assertion: The DNA in the cell nucleus is the information source for making protein.

Reason: A basic event in reproduction is the elimination of a DNA copy

Q.3. Assertion: Fission occurs in unicellular organisms.

Reason: Fission is a process which leads to the formation of new individuals

Q.4. Assertion: Unisexual flowers contain either stamens or pistil, and bisexual flowers contain both stamens and pistil.

Reason: Hibiscus bears unisexual flowers, and papaya bears bisexual flowers.

Q.5. Assertion: Contraceptive pills are used to avoid unwanted pregnancy.

Reason: These pills change hormonal balance in the body and prevent ovulation

COMPETENCY

Q.6. Assertion: Placenta provides nutrition to the developing embryo.

Reason: Placenta is formed in the ovaries.

Q.7. Assertion: In humans, testes are located in scrotum outside the body.

Reason: Scrotum keeps the temperature low for the maturation of sperm.

COMPETENCY

ANSWERS

— Multiple Choice Answers —

1. (d)
2. (c) only P, Q and S

These are the methods of contraception that involve the

insertion of physical devices, which is called the barrier method. Examples of physical barriers are condoms and cervical caps. These devices do not allow the meeting of sperm and egg. Therefore, these devices prevent their fusion in the fallopian tube.

3. (b)

FREE ADVICE. Importance of copying DNA: DNA serves as the hereditary material found within the cells of all living organisms offspring with similar characteristics through the process of DNA replication. The replication of DNA is essential for the inheritance of parental traits. Moreover, DNA replication introduces variations, which serve as the foundation for the emergence of new species.

4. (d) 5. (b) 6. (b) 7. (a)
8. (c) 9. (d) 10. (c) 11. (b)
12. (c) 13. (a) 14. (d) 15. (b)
16. (c)

FREE ADVICE. Plumule is the future shoot, while radicle and cotyledon are future roots and leaves of the plant respectively.

17. (c) 18. (d) 19. (c) 20. (c)
21. (d)
22. (b)

FREE ADVICE. Cause of hepatitis are following:

- Liver damage due to alcohol or toxin exposure.

- Infections caused by viruses (e.g., hepatitis A, hepatitis B, or hepatitis C)
- Fatty liver disease.

23. (d)

FREE ADVICE.

Menarche: Beginning of the menstrual cycle in females. Beginning of menarche is approximately between the age group of 11-16 years.

Menopause: Ending phase of the menstrual cycle in females, menopause may occur between the age group of 45 - 50 years.

24. (d) 25. (d)

— Assertion-Reason Answers —

- (b) Both A and R are true, and R is not the correct explanation of A.
- (c) A is true but R is false.
Explanation. The basic event is known as 'replication', not elimination.
- (b) Both A and R are true, and R is not the correct explanation of A.
- (c) A is true but R is false.
- (a) Both A and R are true, and R is the correct explanation of A.
- (c) A is true but R is false.

FREE ADVICE.

The embryo gets nutrition from the mother's blood with the help of a special tissue called placenta.

- (a) Both A and R are true, and R is the correct explanation of A.

SUBJECTIVE QUESTIONS

— Very Short Answer Questions —

Q1. Bindu wants to produce a hybrid variety of tomatoes. She has tomato plants X and Y belonging to two different varieties, one with smooth, long fruits and the other one with wrinkled, round fruits. [CBSE 2024]

Tomatoes have bisexual flowers. Bindu carries out the following steps carefully to cross pollinate the flowers of plants X and Y:

1. She removes a part of the flowers of tomato plant X just before the flowers bloom.

2. She manually pollinates the flowers of tomato plant X using pollen from the flowers of tomato plant Y.
3. She ties small plastic bags around the pollinated flowers of tomato plant X. The plastic bags are removed after a couple of days.

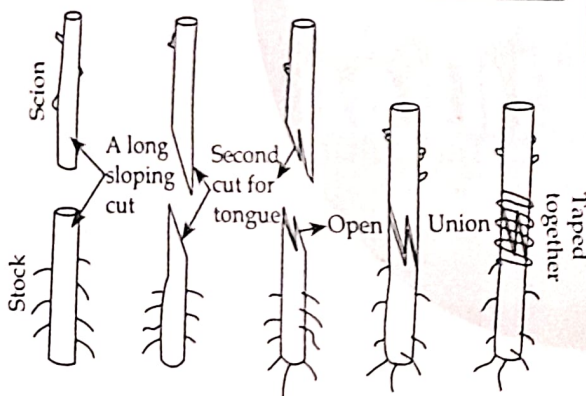
What could be reason for covering the pollinated flowers of plant X?

Ans. to prevent pollen from other plants from reaching the stigma.

Q.2. What is the importance of DNA copying in reproduction. **COMPETENCY**

Ans. The importance of DNA copying in reproduction is that it helps transfer of genes to the progeny and also produces variation.

Q.3. Ajay took a stem cutting (scion) from a red rose plant and a stem (stock) from a white rose plant. After cutting both the stems, he arranged and tied them as shown below. **COMPETENCY**



- (a) Name the type of asexual reproduction seen here.
- (b) What will be the colour of the roses that will be produced in the new plant?

Ans. (a) The asexual reproductive is called vegetative propagation/grafting.

(b) The new plant would produce red flowers.

Q.4. Name the part of Bryophyllum where the buds are produced for vegetative propagation. [CBSE 2016]

Ans. In Bryophyllum, the buds are generated on the leaves.

Q.5. "Cell division is a type of reproduction in unicellular organisms." Justify. **COMPETENCY**

Ans. Cell division is a form of reproduction in unicellular organisms because many unicellular organisms divide into two identical halves during cell division, resulting in the generation of new organisms.

Q.6. How does binary fission differ from multiple fission?

Ans. In binary fission, the parent cell divides into two daughter cells, but in multiple fission, the parent cell divides into many daughter cells.

Q.7. What is a callus? **COMPETENCY**

Ans. A callus is a small group of growing, unorganized cells that are placed in an artificial medium, which helps them divide rapidly.

Q.8. (a) Write the names of those parts of a flower which serve the same function as the following do in the animals:

- (i) Testis, (ii) sperm
- (iii) Ovary (iv) Egg

(b) State the function of flowers in the flowering plants [CBSE 2014]

Ans. (a) (i) testis- anther
(ii) sperms- pollen grains
(iii) ovary - ovary
(iv) egg- ovum

(b) The function of flowers in flowering plants is to carry out sexual reproduction

Q.9. What is the role of the seminal vesicles and the prostate gland? **COMPETENCY**

Ans. Prostate and the seminal vesicles add their secretions so that the sperms are now in a fluid which makes their transport easier and this fluid also provides nutrition.

Q.10. Name the body part where fertilisation occurs in human female. [CBSE 2013]

Ans. Fallopian tube

Q.11. Why is temperature of scrotal sac 2°C less than the body temperature?

[CBSE 2012, 14, 17]

Ans. For the production of sperm, the testes require a temperature 2°C lower than the body temperature.

Q.12. List two functions performed by the testes in human beings. [CBSE 2015]

Ans. The functions of the testes are as follows:

- (i) Secretion of the male sex hormone called testosterone.
- (ii) Production of male gametes (sperm).

Q.13. Why does the lining of uterus become thick and spongy every month?

COMPETENCY

Ans. The lining of the uterus becomes thick and spongy every month to provide a protective and nurturing environment for the growing embryo.

Q.14. List two functions of ovary of human female reproductive system.

[CBSE 2016]

Ans. Function of ovary:

- (i) secretion of female hormones called estrogen and progesterone.
- (ii) Production of female gametes (ovum)

Q.15. (i) Name the reproductive and non-reproductive parts of *Rhizopus*.

(ii) How are the spores protected till they begin to grow?

Ans. (i) Non-reproductive parts are *hyphae* and Reproductive parts are the *sporangia* which contain the spores.
(ii) The spores are covered by thick walls that protect them until they come in contact with a moist surface and begin to grow.

(DAY 19)

Short Answer Questions

Q.1. Water hyacinths reproduce both sexually and asexually. They reproduce sexually by producing seeds through flowers, and asexually by bud formation or fragmentation. It undergoes reproduction through either of the

methods depending on environmental conditions. Water hyacinths bloom freely in water-rich conditions whereas, reproduction for survival is more effort intensive in water-scarce conditions.

(a) Explain why this variation in reproduction is required in water hyacinths.

(b) Which mode of reproduction is likely to occur in the following conditions? Justify: (i) abundance of water (ii) scarcity of water

COMPETENCY

Ans. (a) • The population of each species thrives in its specific habitat/niche, having particular environmental conditions which can change due to reasons beyond the organisms' control.

• Having variation ensures greater chances of survival through such changes.

(b) (i) Asexual reproduction

• In its natural environment, the organism is likely to undergo an energy efficient method of reproduction such as asexual reproduction.

(ii) Sexual reproduction

• In a stressed environment, the organism is likely to opt for the effort-intensive method for survival.

Q.2. (a) How do organisms reproduced by fission?

(b) Write names of any two organisms which reproduce by this method.

(c) Differentiate between the fission of *Leishmania* and *Plasmodium*.

[CBSE 2013, 17]

Ans. (a) Binary fission and multiple fission methods are used by unicellular organisms, which assist in reproduction.

(b) Protozoa and *Leishmania*.

(c) *Leishmania* reproduces with the help of binary fission, while *Plasmodium* reproduces with the help of multiple fission.

Q.3. List two advantages of propagating banana plants through vegetative propagation. [CBSE 2013]

Ans. Two benefits of cultivating grape or banana plants through vegetative propagation are:

- Fruit trees propagated through vegetative methods yield fruits much sooner.
- Bananas and grapes either produce very few seeds or do not produce viable seeds, that is why their plants are propagated vegetatively.

Q.4. (a) Name the following:

- Thread like non-reproductive structures present in Rhizopus that develop at the tips of the non-reproductive threads in Rhizopus.
- Blobs that develop at the tips of the non-reproductive thread in Rhizopus.

(b) Explain the structure and the function of the structures released from the 'blobs' in Rhizopus.

Ans. (a) (i) The filamentous, non-reproductive structures found in Rhizopus are called hyphae.

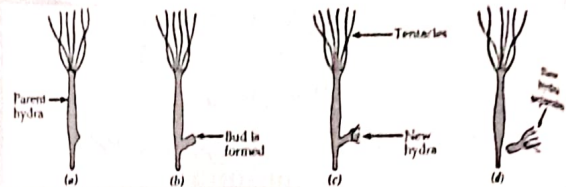
(ii) The spherical structures at the tip of hyphae are known as sporangia.

(b) Filamentous, non-reproductive structures called hyphae develop on the substrate (like bread). At the tips of these hyphae, small spherical structures called sporangia develop, which contain spores. These spores have the potential to develop into new Rhizopus individuals. The spores are encased in thick walls that shield them until they encounter another moist surface, such as bread, where they will begin to grow.

Q.5. With the help of suitable diagrams, explain the various steps of budding in Hydra. **COMPETENCY**

Ans. Hydra reproduces by budding which is an asexual type of reproduction.

Fig. 2.1 this form of reproduction a bulbous projection emerges from the parent body, referred to as a bud. The bud may be comprised of unicellular or multicellular cells formed through mitotic division. Then, this bud undergoes gradual growth, ultimately developing into a small hydra. Eventually, the miniature new hydra separates itself from the parent hydra body and exists as an independent organism. Thus, the parent hydra generates a new hydra.



Q.6. Distinguish between unisexual and bisexual flowers giving one example of each. [CBSE 2016]

Ans.

Unisexual flowers	Bisexual flowers
Unisexual flowers contain either stamens or pistil.	Bisexual flower contain both stamens and pistil.
They undergo both self and cross pollination depending on whether its monoecious or dioecious flowers.	They undergo both self pollination and cross-pollination.
They're called incomplete flower.	They're called complete flower.
Example: Papaya and watermelon	Example: Hibiscus and mustard

Q.7. Compare the reproductive parts of flowers and humans and answer the questions below:

- Which part of the human female reproductive system has a similar function as the stigma in a flower? Give a reason to support your answer.
- Testes in the male reproductive system would correspond to which part of the male reproductive system in a flower? Justify.

(c) The style of a flower and the fallopian tube in humans correspond functionally with each other. Is this statement true? Justify your answer.

Ans. (a) • Part - Cervix/Vagina

• Reason - The stigma of the flower serves as the point of entry of the male gametes/pollen grains, similarly, the cervix serves as the point of entry of the male gametes/sperm in humans/vagina receives the male gametes in humans.

(b) • Part - anther

• Function - produces male gametes in form of pollen, just like testes which produce sperms

(c) • The given statement is False.

• Reason - the main function of the fallopian tube is to serve as the point of fertilisation, which is not the function of the style in flowers.

Q.8. What are secondary sexual characters in humans? Name one such character of male and female. [CBSE 2013]

Ans. Secondary sexual characteristics develop when a human being reaches puberty, and these characteristics are governed by sex hormones. Secondary sexual characteristics in males include body hair growth and voice deepening, while in females, secondary sexual characteristics include an increase in breast size and darkening of the skin around the nipples at the top of the breasts.

Q.9. What are the functions of testes in the human male reproductive system? Why are these located outside the abdominal cavity? What is responsible for bringing about changes in appearance seen in boys at the time of puberty? [CBSE 2016]

Ans. Functions of testes include:

(i) Producing male sex cells (or male gametes) known as sperms.

(ii) Producing the male sex hormone called testosterone.

The testes of a man are situated within a small muscular pouch called the scrotum, located outside the abdominal cavity of the body. This positioning is essential because sperm formation requires a lower temperature than the normal body temperature. By being outside the abdominal cavity, the scrotum maintains a temperature approximately 3°C lower than the temperature inside the body, thereby providing the testes with an optimal temperature for sperm production. The male sex hormone testosterone is responsible for the physical changes observed in boys during puberty.

Q.10. What are sexually transmitted diseases? Write two examples each of sexually transmitted diseases caused by (i) virus, (ii) bacteria. Explain how the transmission of such diseases be prevented? [CBSE 2020]

Ans. Diseases which are transmitted from an infected person to a healthy person due to sexual contact are called Sexually Transmitted Diseases (STD). Sexually transmitted diseases caused by virus and bacteria which causes AIDS and gonorrhoea respectively.

(i) Transmission of such diseases can be prevented by the following ways:
Screening tests for blood donors.

(ii) Mutually faithful monogamous relationship.

(iii) Using condoms etc.

FREE ADVICE. AIDS is a very dangerous and infectious disease which is caused by HIV (Human Immuno Deficiency Virus)

called stem cells have the ability to divide and differentiate into different cell types. This helps in the replacement of a damaged organ.

Name and explain two methods of asexual reproduction that are similar to stem cells and occur mostly in multicellular organisms

(b) Identify TWO pairs of reproductive organs in males and females that are functionally similar to each other. Justify.

Ans. (a) • Regeneration

In this process, if an individual organism is cut or broken up into many pieces, many of these pieces grow into separate individuals.

• Budding

In budding, a small outgrowth or bud forms on the parent organism, which eventually detaches and develops into a new individual.

(b) • Testes and ovaries

both structures perform the function of producing gametes and hormones crucial for reproduction.

• Vas deferens and Fallopian Tube
both structures are responsible for carrying the gamete to the site of fertilisation.

(DAY 20)

Long Answer Questions

Q.1. List five distinguishing features between sexual and asexual types of reproductions in tabular form.

COMPETENCY

Ans.

	Asexual reproduction	Sexual reproduction
(i)	Gamete formation does not take place.	Gamete formation takes place.

		Zygote formation occurs.
(iii)	Only one parent is required.	Two parents required.
(iv)	Genetic variation does not occur.	Genetic variation occurs.
(v)	Meiosis does not occur at any stage of reproduction.	Meiosis is essential for gamete formation.

Q.2. Identify the following methods and give one example of each.

(a) Process in which reproduction takes place by breaking up of parent into fragments.

(b) Process of dividing of organisms into many cells simultaneously.

(c) Process of reproduction by formation of bud on parent body.

(d) Process of reproduction by formation of spores.

(e) Process used by multicellular organisms to reproduce by cutting into many pieces each piece forms a new individual. [CBSE 2016]

Ans. (a) Fragmentation, example- Spirogyra.

(b) Multiple fission, example - Plasmodium.

(c) Budding, example -Hydra.

(d) Spore formation, example -Rhizopus.

(e) Regeneration, example -Planaria.

Q.3. Give reason for the following:

(a) During reproduction inheritance of different proteins will lead to altered body designs.

(b) Fertilization cannot take place in flowers if pollination does not occur.

(c) All multicellular organisms cannot give rise to new individuals through fragmentation

(d) Vegetative propagation is practised for growing only some type of plants. COMPETENCY

Ans. (a) The DNA contained within the nucleus of a cell serves as the blueprint for producing proteins. If alterations occur during DNA replication, it

results in the production of different proteins, leading to changes in body structure.

(b) For fertilization to occur, the male gamete must combine with the female gamete. Therefore, it is essential that pollen grains from the anther of the stamen are transported to the stigma of the carpel. Pollination is the process responsible for transferring pollen grains from the anther of a stamen to the stigma of a carpel.

(c) Regeneration or fragmentation is a viable method of reproduction only for organisms with relatively simple body organization. Complex multicellular organisms exhibit a high degree of structural organization in their bodies, where specialized cells form tissues, tissues constitute organs, organs make up organ systems, and finally, organ systems compose complete organisms. Take, for example, a cat, a complex multicellular organism that cannot regenerate from a severed body part, such as a tail. This limitation arises because the cells present in the severed tail of a cat cannot generate the organs necessary for creating a complete dog, such as the heart, lungs, brain, stomach, and intestines.

(d) Vegetative propagation typically involves the growth and development of one (or more) dormant buds located on the older part of the plant, leading to the formation of a new plant. These buds remain inactive within the old plant. When provided with suitable conditions, these dormant buds grow to give rise to new plants. Therefore, only plants that possess these dormant buds in their body parts, such as the stem or root, can be propagated through vegetative propagation.

Q.4. (a) Name the two types of pollination and differentiate between them.

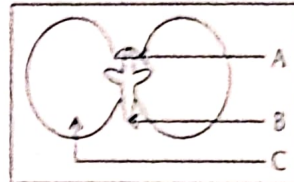
(b) Explain the post fertilization changes, that occur in the ovary of a flower.

(c) A diagram of a germinating seed is given here. Label the parts that

(i) gives rise to future shoot.

(ii) gives rise to future root system.

(iii) stores food. [CBSE 2023]



Ans. (a)

	Self-fertilization	Cross-pollination
(i)	In self-fertilization, the pollen grains from the anther are transferred to the stigma of the same flower.	In cross-pollination, the pollen grains from the anther are transferred to the stigma of different flowers.
(ii)	Variation is not introduced.	Variation is introduced.
(iii)	No external pollinator is required.	An external pollinator is required, such as honey bees.
(iv)	Offspring are homozygous.	Offspring are heterozygous.
(v)	Example: Pea	Example: Apple

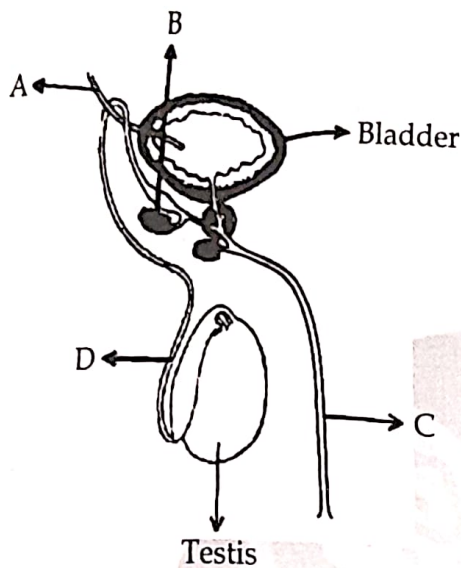
(b) After fertilization, the zygote undergoes several divisions to develop into an embryo within the ovule. The ovule undergoes a transformation, acquiring a tough outer coat and gradually maturing into a seed, which contains the embryonic plant. In fact, all the eggs within the ovules found in the ovary are fertilized by male gametes from pollen grains and develop into seeds. The flower's ovary undergoes development, eventually becoming a fruit with seeds inside. The fruit serves to protect the seeds.

(c) (i) Part A, which gives rise to the future shoot, is referred to as the Plumule.

(ii) Part B, responsible for the future root system, is called the Radicle.

- (iii) Part C, which stores food, is known as the Cotyledon.

Q.5. Based on the given diagram answer the questions given below:



- (a) Label the parts A, B, C and D.
 (b) Name the hormone secreted by testis and mention its role.
 (c) State the functions of B and C in the process of reproduction.

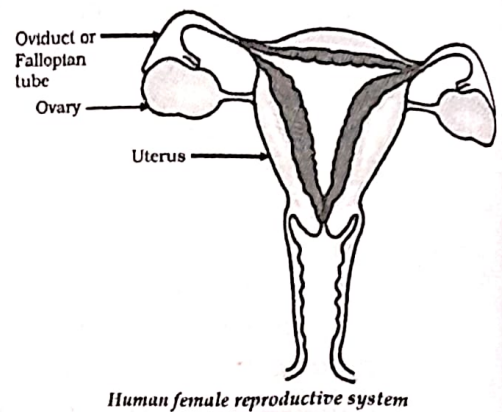
COMPETENCY

- Ans. (a) A—Ureter, B—Seminal vesicle
 C—Urethra, D—Vas deferens
 (b) Testosterone is released from testes which is important for sperm production and development of male human sexual characters.
 (c) B is seminal vesicles which secretes a fluid which provides nutrition to sperms and makes their transportation easily.
 C is Urethra which is a common passage for urine and sperm.

Q.6. (a) Draw a sectional view of human female reproductive system and label the part where—

- (i) eggs develop.
 (ii) fertilization takes place.
 (iii) fertilized egg gets implanted.
 (b) Describe in brief the changes the uterus undergoes
 (i) to receive the zygote.
 (ii) if zygote is not formed. [CBSE 2015]

Ans. (a)

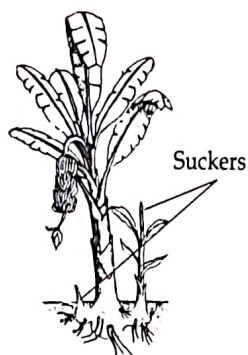


Human female reproductive system

- (i) In the ovary egg develop
 (ii) In fallopian tube fertilization takes place
 (iii) In uterus fertilized egg gets implanted
 (b) (i) When the uterus receives the zygote, the zygote undergoes rapid mitotic division, forming a hollow ball of hundreds of cells known as an embryo. This embryo becomes embedded in the thick lining of the uterus, a process referred to as implantation. Then, disc-like specialized tissue known as the placenta develops between the uterine wall and the embryo. Through the placenta, there is an exchange of nutrients, oxygen, and waste products between the embryo and the mother.
 (ii) In the event that the zygote is not received by the uterus, the thick and soft uterine lining, rich in blood capillaries, is no longer necessary. The unfertilized ovum typically dies within a day, leading to the breakdown of the uterine lining. This breakdown results in the release of blood and tissue in the form of vaginal bleeding. This vaginal bleeding is commonly known as menstrual flow or menstruation, and it also includes the unfertilized egg.

Q.7. The image shows a banana plant which is growing with the help of suckers. These suckers are small plant stem outgrowths which can be separated

from the main plant and planted separately and they will grow into a new plant subsequently. [CBSE 2024]



- (i) Give the name and type of reproduction that is shown in the given image.
- (ii) List *two* advantages the farmer will have on using the type of reproduction mentioned above.
- (iii) The plant produces male flowers. Explain how this plant will be involved in the process of pollination.
- (iv) Why is the offspring of this banana plant not absolutely identical to its parent plant?

Ans. (i) **Name:** Vegetative propagation
Type of Reproduction. Asexual reproduction.

(ii) **Advantages of Vegetative Propagation:**

- (a) Plants grown by vegetative propagation grow much faster than those grown from seeds.

(b) A large number of plants can be produced by the method of vegetative propagation.

(c) The plants grown by vegetative propagation usually need less attention in their early years than the plants grown from seeds.

(d) Seedless plants can also be grown from this method.

(iii) **Cross pollination.** The pollen grains from the anther of a flower on one plant are transferred to the stigma of a flower on another banana plant, using agents like wind, water or stigma etc.

(iv) There is a slight variation which is introduced in asexual reproduction because the copying of DNA in the cell is done by certain biochemical reactions which synthesize more of genetic material. No biochemical reaction can produce 100% same results. So when the DNA already present in the nucleus of the parent cell is copied at the time of asexual reproduction, then slight variations come in the two copies formed. Due to this, the two DNA molecules formed will be similar but may not be exactly identical and will lead to slight variation in the offsprings.

CASE BASED QUESTIONS

Q.1. Ayan places a wetslice of bread and keeps it in a cool, moist, and dark place. He observes the changes daily with the help of a magnifying glass. Answer the following questions:

COMPETENCY

(a) After a week, what does Ayan observe?

(b) What is the structure of Rhizopus?

Ans. (a) He observes that after a week, a layer of white mass has covered the

surface of the slice, and it is a mold called Rhizopus.

(b) Rhizopus has a thread-like structure and tiny bulbous structures, also known as sporangia, responsible for spore formation.

Q.2. Arpit takes a potato and cuts it into small pieces, ensuring that some pieces contain a notch or bud while others do not. Afterwards, he spreads some cotton

on a tray, wets it, and then places the pieces with buds on it. He observes the changes taking place in these potato pieces over the next few days.

Answer the following question.

COMPETENCY



- What does he observe in the next few days?
- What happens to the potato pieces that do not have buds?
- Is this vegetative propagation? If yes, then justify.

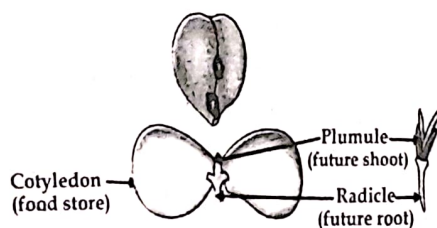
Ans. (a) He observes that the potato pieces with buds gradually grow and develop.

- Potato pieces without buds do not show any growth or development.

(c) Yes, this is vegetative propagation because a part of a single parent is used to develop new individuals.

Q.3. Sandeep soaks a few seeds of Bengal gram (*chana*) and keeps them overnight. Then, in the morning, he drains the excess water and covers the seeds with wet cloth, leaving them for 2-3 days.

Answer the following question:



- How many cotyledons does Bengal gram have?

- What is the function of cotyledons?
- What is the future shoot and future root in a germinating seed?

Ans. (a) Two

(b) To store food.

(c) The plumule is the future shoot, and the radicle is the future root.

Q.4. Vikas notices many campaigns aimed at raising awareness among the youth about a healthy sexual life. Many government workers were educating adults about family planning and STDs, etc. Now, please feel free to ask your questions.



(a) Name a contraceptive method that does not have side effects.

(b) List four points of significance of reproductive health in a society.

(c) Name any two areas related to reproductive health which have improved over the past 50 years in our country? [CBSE 2024]

Ans. (a) Barrier methods, such as condoms

(b) The significance of societal reproductive health:

(i) Consistent medical care and check-ups have contributed to the advancement of reproductive health. Healthy mothers give birth to healthy children.

(ii) The preservation of reproductive health is essential for preventing sexually transmitted diseases (STDs).

(c) Areas of Improvement:

(i) Enhanced family planning has resulted in smaller family sizes and improved economic stability.

(ii) Increased awareness and broader contraceptive use have led to a decrease in STD cases.

(DAY 20 SWAHA)

9

Heredity



What did CBSE ask last year?

MCQs & A/R	2 Questions ($2 \times 1 = 2$ Marks)
Subjective	No Questions asked
Case Based	No Questions asked

Note: All the above typology of questions include 'Competency based Questions' labelled as

COMPETENCY

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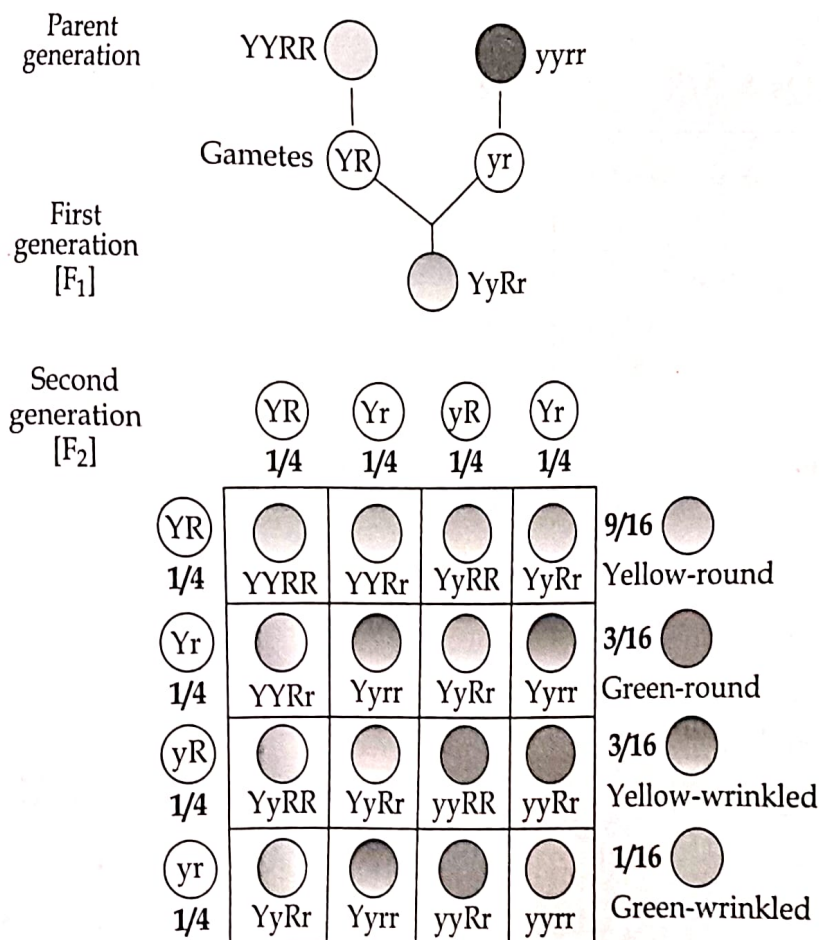


Heredity

□ Variation during reproduction

□ Mendel's Contribution

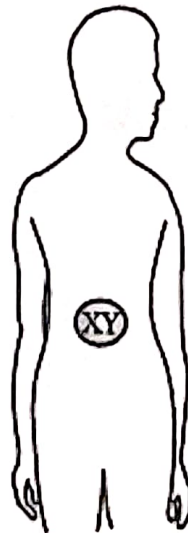
(Both the monohybrid and dihybrid cross are the most important topics)



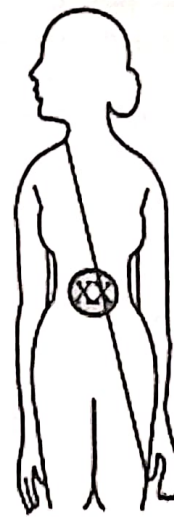
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Sex Determination

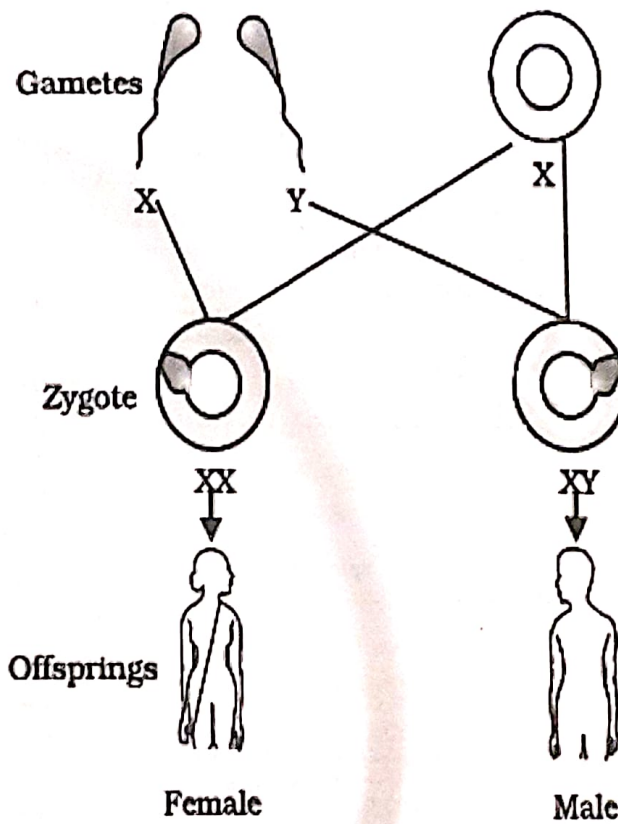
(CBSE loves to ask the prediction of sex of the child in different cases)



Male



Female



OBJECTIVE QUESTIONS

(DAY 21)

Multiple Choice Questions

Q.1. If a trait A exists in 10% of a population of an asexually reproducing species and a trait B exists in 60% of the same population, which trait is likely to have arisen earlier?

COMPETENCY

- (a) Trait A
- (b) Trait B
- (c) Both A and B
- (d) None of these

Q.2. Manisha is an Indian actress. She was born in Delhi to a homemaker mother and an engineer father. She is around 5 feet tall. She has naturally curly hair. She has trained in contemporary and ballet dancing.

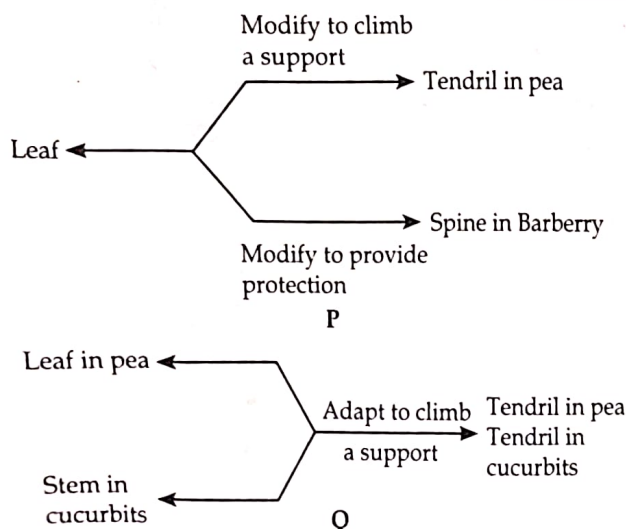
Which of these is MOST LIKELY to be true about her children?

COMPETENCY

- (a) They may dance well.
- (b) They may grow up to have curly hair.
- (c) They may be born to an engineer father.
- (d) They may become famous actors one day.

Q.3. Study the diagrams given below that depict the analogy/homology of organs and answer the questions that follow.

COMPETENCY



Which diagram represents evolution of homologous organs?

- (a) Only P
- (b) Only Q
- (c) Both P and Q
- (d) Neither P or Q

Q.4. In cattle, having horns is a recessive trait (h) to not having horns (H). When cattle with horns are crossed with cattle that do not have horns, the number of offspring having horns was equal to those not having horns.

COMPETENCY

Which of the following is MOST LIKELY to be true?

- (a) Both parents are homozygous dominant.
- (b) One parent is homozygous dominant.
- (c) Both parents are heterozygous.
- (d) One parent is heterozygous.

Q.5. The number of chromosomes in parents and offsprings of a particular species undergoing sexual reproduction remain constant due to:

[CBSE 2023]

- (a) doubling of chromosomes after zygote formation.
- (b) halving of chromosomes after zygote formation.
- (c) doubling of chromosomes before gamete formation.
- (d) halving of chromosomes at the time of gamete formation

Q.6. In an experiment with pea plants, a pure tall plant (TT) is crossed with a pure short plant (tt). The ratio of pure tall plant to pure short plants in F₂ generation will be

[CBSE 2023]

- (a) 1:3
- (b) 3:1
- (c) 1:1
- (d) 2:1

Q.7. A cross between pure tall and pure short pea plants gives hybrid tall pea plants in the first generation. What would be the genotypic ratio in the offspring of the second generation if these F₁ plants were self-pollinated?

COMPETENCY

- (a) 3 : 1 (b) 9 : 3 : 3 : 1
(c) 1 : 2 : 1 (d) 1 : 1

Q.8. If a round, green seeded pea plant (RR yy) is crossed with wrinkled, yellow seeded pea plant, (rr YY) the seeds produced in F₁ generation are
(a) round and yellow
(b) round and green
(d) wrinkled and green
(d) wrinkled and yellow

Q.9. In human males all the chromosomes are paired perfectly except one. This/ these unpaired chromosome is/are

COMPETENCY

- (i) large chromosome
(ii) small chromosome
(iii) Y-chromosome
(iv) X-chromosome
(a) (i) and (ii) (b) (iii) only
(c) (iii) and (iv) (d) (ii) and (iv)

Q.10. Two pea plants one with round green seeds (RRyy) and another with wrinkled yellow (rrYY) seeds produce F₁ progeny that have round, yellow (RrYy) seeds. When F₁ plants are selfed, the F₂ progeny will have new combination of characters. Choose the new combination from the following

[CBSE 2024]

- (i) Round, yellow
(ii) Round, green
(iii) Wrinkled, yellow
(iv) Wrinkled, green
(a) (i) and (ii) (b) (i) and (iv)
(d) (ii) and (iii) (d) (i) and (iii)

Q.11. Which of the following is/are TRUE about traits that have NOT been naturally selected?

COMPETENCY

- X. They were always detrimental to the life of the organism.
Y. Their frequency reduces in subsequent generations.
Z. Organisms carrying these traits cannot reproduce at all.
(a) Only X (b) Only Y
(c) Only Y and Z (d) Only X and Z

Q.12. If a tall pea-plant bearing red flowers- (TTRr) is crossed with another pea plant that is short and has white flowers (ttrr), what percentage of GAMETES will have both alleles for short and white flowers?

COMPETENCY

- (a) 0% (b) 25%
(c) 50% (d) 75%

Q.13. Select the statements that describe characteristics of genes

COMPETENCY

- (i) genes are specific sequence of bases in a DNA molecule
(ii) a gene does not code for proteins
(iii) in individuals of a given species, a specific gene is located on a particular chromosome
(iv) each chromosome has only one gene
(a) (i) and (ii) (b) (i) and (iii)
(d) (ii) and (iv) (d) (i) and (iv)

— Assertion Reason Questions —

Following questions consist of two statements: Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

- (a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, and R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

Q.1. **Assertion:** Inheritance from the previous generation provides both a common basic body design and subtle change in it for next generation.

Reason: The second generation will make a difference that they will not inherit from the first generation.

COMPETENCY

Q.2. **Assertion:** Mendel is known as the father of genetics.

Reason: Mendel performed several experiments on pea plant and laid down basic laws of inheritance.

Q.3. **Assertion:** Inherited characters come into offspring from parents. [CBSE 2024]
Reason: Knowledge and skills are inherited characters.

Q.4. **Assertion:** Mendel told that characters are controlled by a pair of factors.

Reason: The factors of Mendel are now called genes. **COMPETENCY**

Q.5. **Assertion:** A dominant character masks the effect of a recessive character.

Reason: A dominant gene is always represented by a small letter.

Q.6. **Assertion:** Phenotype is the external expression of a gene.

Reason: Expression of a character is governed by genes (factors).

Q.7. **Assertion.** Most human chromosomes have a maternal and a paternal copy and humans have 69 such pairs.

Reason: Only one pair among them is known as 'sex-chromosome' rest all are called as autosomes. **COMPETENCY**

Q.8. **Assertion (A):** In humans, if gene (b) is responsible for black eyes and gene (B) is responsible for brown eyes, then the colour of eyes of the progeny having gene combination Bb, bb or BB will be black only.

Reason (R): The black colour of the eyes is a dominant trait. **COMPETENCY**

ANSWERS

Multiple Choice Answers

1. (b) **Explanation:** Trait A is a recently emerging characteristic in the asexually reproducing species since it is observed in just 10% of the population and trait B already exists 60% in the same population. Therefore, it's probable that trait B appeared at an earlier stage.

2. (b) 3. (a) 4. (d) 5. (d)

6. (b) 7. (c) 8. (a) 9. (c)

10. (b) 11. (b) 12. (c) 13. (b)

Assertion-Reason Answers

1. (c) A is true but R is false.

2. (a) Both A and R are true, and R is the correct explanation of A.

3. (c) A is true but R is false.

Explanation: A genotype can also be defined as the full set of inheritable genes that can be passed on to the offspring from its parents.

4. (b) Both A and R are true, and R is not the correct explanation of A.

5. (c) A is true but R is false.

6. (b) Both A and R are true, and R is not the correct explanation of A.

7. (d) A is false but R is true.

8. (d) A is false but R is true.

SUBJECTIVE QUESTIONS

Very Short Answer Questions

Q.1. How does the creation of variations in a species promote survival?

COMPETENCY

Ans. Variation increases the chances of survival for organisms by helping them adapt to the changing environment."

Q.2. What is the cause of variation in asexually reproducing organisms?

[CBSE 2012]

Ans. Environmental factors and mutations.

Q.3. What is heredity?

[CBSE 2014]

Ans. The transfer of traits from the parents to their offspring is referred to as heredity.

Q.4. Name the information source for making proteins in the cells.

[CBSE 2014]

Ans. DNA-(Deoxyribo Nucleic Acid) is the information source for making proteins in the cells

Q.5. A Medelian experiment consisted of breeding pea plants bearing violet

flowers with pea plants bearing white flowers. What will be the results in F₁ progeny? [CBSE 2018]

Ans. All plants bear violet flowers in the F₁ progeny.

Q.6. Write the sex of the baby that inherits Y-chromosomes from the father.

[CBSE 2014]

Ans. Male

Q.7. A normal baby girl receives her X chromosome from whom : mother, father, both mother and father or either from mother or father? [CBSE 2015]

Ans. Baby girl receives her X chromosome from both mother and father.

Q.8. Name the plant on which Mendel performed his experiments.

[CBSE 2013, 14]

Ans. *Pisum sativum* (Garden pea)

Q.9. How many pairs of chromosomes are present in human beings? [CBSE 2016]

Ans. 23 pairs

— Short Answer Questions —

Q.1. What is DNA copying? State its importance. [CBSE 2015]

Ans. A process in which a DNA molecule generates two identical copies of itself in a reproducing cell through a chemical reaction is termed DNA replication. It has important significance because it facilitates the transmission of traits from parents to the next generation (offspring).

Q.2. What is the effect of DNA copying, which is not perfectly accurate, on the reproduction process? **COMPETENCY**

Ans. DNA replication is not entirely precise. In reproduction, no biochemical reaction can be deemed entirely dependable, which means that the DNA replication process will exhibit some variability on each occasion. Consequently, the DNA copies produced will be similar but not necessarily identical to the original.

Consequently, the newly formed cells that are similar to one another but possess subtle differences. This inherent inclination for variation during reproduction is essential is the basic for evolution.

Q.3. How do organisms, whether reproduced asexually or sexually maintain a constant chromosome number through several generations? Explain with the help of suitable example. [CBSE 2016]

Ans. In asexual reproduction, organisms undergo only mitotic division. The DNA within the chromosomes of the cells involved is replicated and then equally distributed among the two daughter cells formed. Consequently, the chromosome number remains unchanged.

In sexual reproduction, organisms produce gametes through a division called meiosis (reduction division), where the original number of chromosomes is halved. These two gametes subsequently combine to form a zygote, restoring the original chromosome number. For instance, in humans, both parents (the father and mother) have 46 chromosomes or 23 pairs. In gametes, sperm carries half the number of chromosomes, i.e., 23, and the egg also contains 23 chromosomes. When the sperm and egg unite, the resulting zygote possesses 46 chromosomes or 23 pairs. Therefore, the chromosome number remains consistent throughout the process.

Q.4. What are chromosomes? Explain how in sexually reproducing organisms the number of chromosomes in the progeny is maintained. [CBSE 2015]

Ans. Chromosomes are thread-like formations composed of DNA and proteins. They are located in the nucleus during cell division.

Meiosis takes place during gamete formation, reducing the initial number

of chromosomes by half. Therefore, when two gametes merge, the resulting zygote contains the complete set of chromosomes, restoring the original number of chromosomes in the offspring.

Q.5. State the importance of chromosomal difference between sperms and eggs of humans. [CBSE 2013, 2014]

Ans. A male possesses one X chromosome and one Y chromosome. So, half of the sperm cells will carry X chromosomes, while the remaining half will carry Y chromosomes. On the other hand, a female has two X chromosomes, resulting in all female gametes carrying only X chromosomes.

If a sperm carrying an X chromosome fertilizes an ovum, the resulting child will be a girl. Conversely, if a sperm carrying a Y chromosome fertilizes an ovum, the child born will be a boy. Therefore, the chromosomal difference between human sperm and eggs determines the sex of the child.

Q.6. A blue colour flower plant denoted by BB is crossbred with that of white colour flower plant denoted by bb.

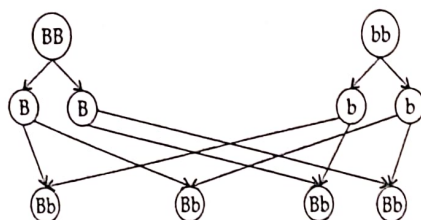
(a) State the colour of flower you would expect in their F_1 generation plants.

(b) What must be the percentage of white flower plants in F_2 generation if flowers of F_1 plants are self-pollinated?

(c) State the expected ratio of the genotypes BB and Bb in the F_2 progeny.

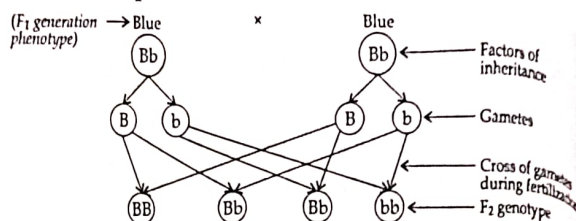
COMPETENCY

Ans. (a)



All the flowers in the F_1 generation are blue.

(b) If flowers of F_1 plants are self-pollinated.



Ratio of (blue flower plant) to (white flower plant) = 3 : 1

Percentage of white flower plant
= white flower plants/Total plants
of F_2 generation $\times 100 = \left(\frac{1}{4}\right) \times 100$
= 25%

(c) In F_2 generation: F_2 phenotype generation \rightarrow Blue Blue Blue White

F_2 genotype generation-

BB Bb Bb bb

BB : Bb : bb = 1 : 2 : 1

Genotype ratio if BB and BW in F_2 progeny is BB : BW : 1 : 2

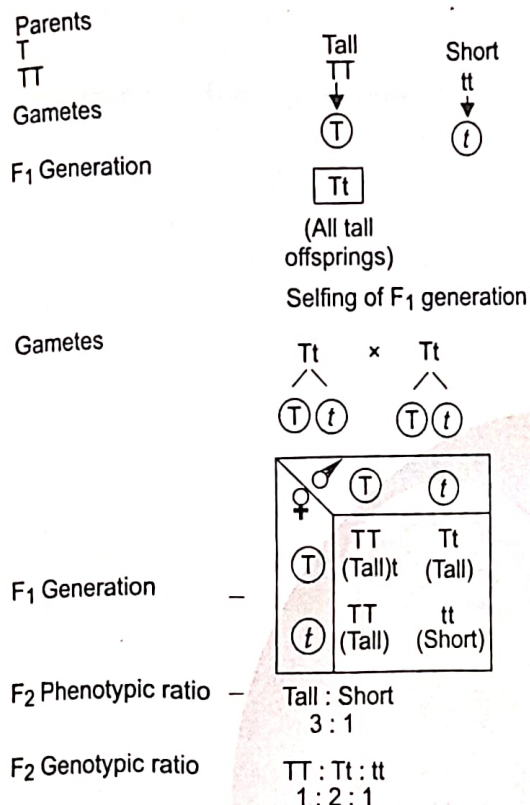
Q.7. How is the sex of a child determined in human beings? [CBSE 2012, 13, 14]

Ans. There are 23 pairs of chromosomes in the cell of human body. Out of these, 22 pairs do not take part in sex-determination in human beings. The 23rd pair in gonadal cell called sex chromosome which is not always a perfect pair. Women have perfect pair having XX- a chromosomes. But men have a pair having XY- chromosomes. This cell is divided meiotically in both men and women to form gametes. All children will inherit an X-chromosome from mother and an X- or Y-chromosomes from their father. Thus, the sex of child is determined by the chromosomes they inherit from their father. A child inheriting X-chromosome from father will be a girl and one inheriting Y-chromosome from him will be a boy.

Q.8. Name the plant Mendel used for his experiment. What type of progeny was obtained by Mendel in F_1 and generations when he crossed the tall and short plants? Write the ratio he obtained in F_2 generation plants.

[CBSE 2014]

Ans. Pea plants (*Pisum Sativum*) were used in Mendel's experiment.



Q.9. Guinea pig having black colour when crossed with guinea pig having same colour produced 80 offsprings out of which 60 were black and 20 were white. Now, find out

- What is the possible genotype of the guinea pig?
- Which trait is dominant and which trait is recessive?
- What is this cross called as and what is its phenotypic ratio?

[CBSE 2012]

- Ans. (i) Bb × Bb is the possible genotype of the guinea pig.
(ii) White is recessive while black is dominant.
(iii) Monohybrid cross.

(DAY 22)

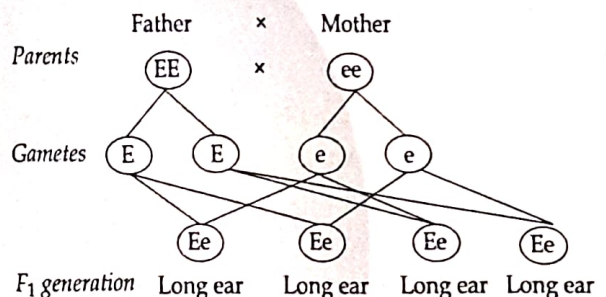
Long Answer Questions

Q.1. (i) In a family of four individuals, the father possessed long ears and

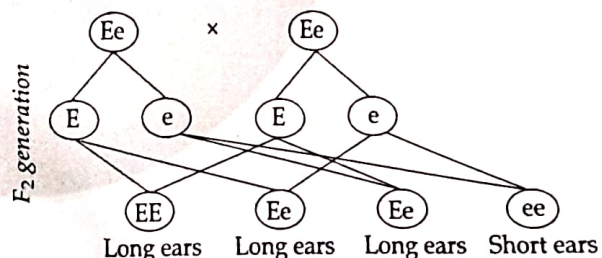
the mother possessed short ears. If the parents had pure dominant and recessive traits respectively, then calculate the ratio of genetic makeup of F₂ generation. Show a suitable cross.

- (ii) If father had short ears and the mother had long ears, explain what effect it will have on the ratio of genetic makeup in F₂ generation.

Ans. (i) Father's long ears = EE dominant trait
Mother's short ears = ee recessive trait



In F₁ generation, all offsprings will have long ears but they are not pure dominant.



- (ii) Ratio of F₂ generation will be same i.e., 1 : 2 : 1 as the cross is still between a pure dominant and recessive traits which is shown above.

Q.2. Explain Mendel's concept of heredity, by giving three points. [CBSE 2016]

Ans. Mendel proposed three laws, which are:

- (i) (a) **Law of Segregation:** Each inherited trait is determined by a pair of genes. Parental genes are randomly separated into the germ cells, resulting in germ cells containing only one gene pair.
- (b) **Law of Independent Assortment:** Genes governing different traits assort independently of each other, meaning that the inheritance of one trait is not contingent on the inheritance of another.
- (c) **Law of Dominance:** An organism with alternative forms of a gene will express the form that is dominant.
- (ii) Mendel conducted research on pea plants (*Pisum sativum*) and unveiled the fundamental laws of inheritance. He discovers that traits (characteristics) are governed by factors (now known as genes), and each factor (gene) occurs in pairs. These factors (genes) are inherited as discrete units, one from each parent.
- (iii) Mendel observed that genes segregate during gamete formation (sperm in males and ova in females) and subsequently reunite in the offspring, with one coming from each parent. These genes manifest as dominant or recessive traits, a distinction that can be discerned through test crosses.

- Q3. (a)** Why did Mendel choose garden pea for his experiments? Write two reasons.
- (b)** List two contrasting visible characters of garden pea Mendel used for his experiment.
- (c)** Explain in brief how Mendel interpreted his results to show that the traits may be dominant or recessive. [CBSE 2016]

- Ans. (a) Reasons to use garden peas are:
- (i) Short life cycle.

(ii) Both self and cross-pollination are possible in pea plants.

(iii) Presence of contrasting visible characters.

(b) Contrasting visible characters in pea plants are:

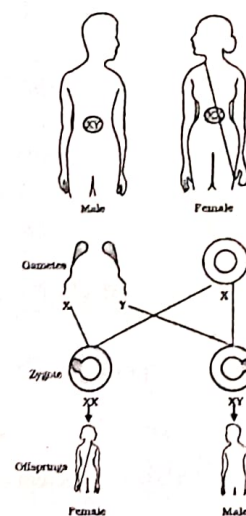
(i) Round/Wrinkled seeds.

(ii) Tall and short plants.

(c) Mendel crossed two pea plants with a pair of contrasting characters. Only one character is shown in the F_1 progeny, while the other character remains hidden. However, on selfing the F_1 generation, the hidden character reappeared in 25% of the progeny, and 75% exhibited the character of the F_1 generation. Mendel concluded that the character expressed in 75% of the individuals of F_2 is dominant, while the other is recessive.

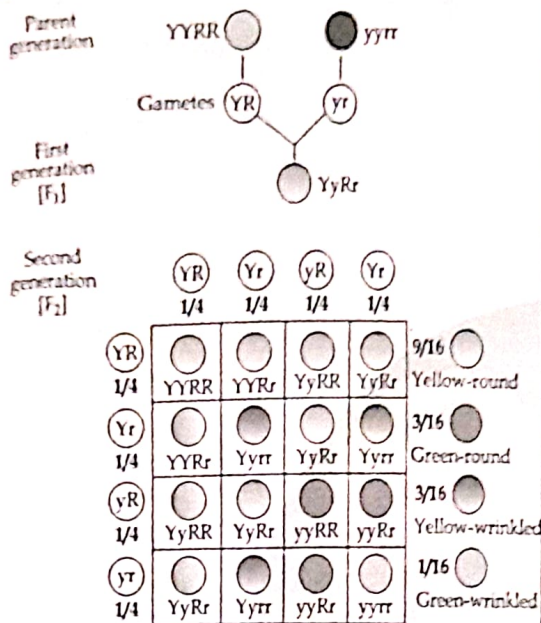
Q4. How is the equal genetic contribution of male and female parents ensured in the progeny? [NCERT, CBSE 2011, 13]

Ans. The gametes of both the male and female parents contain half of the genetic information necessary for the offspring. As a result, 23 chromosomes are inherited from the father, and 23 chromosomes are inherited from the mother. So, there is an equal contribution of genetic material from males and females to the offspring.



Q.5. Illustrate the dihybrid cross between wrinkled green seeds and round-yellow seeds conducted by Mendel with a Punnet's square. [CBSE 2016]

Ans.



Q.6. A scientist wanted to determine whether a tall pea plant X was TT or Tt.

To do this he crossed two X plants:

- one with a pea plant known to carry the TT traits.
 - one with a pea plant known to carry the tt traits.
- (a) Considering that X could be TT or Tt, what ratios would he obtain in both crosses - (i) and (ii)? Show the crosses.
- (b) Based on the ratios obtained in (a), a cross with which parent -

(i) or (ii) - would help in identifying whether X was TT or Tt? Justify.

COMPTENING

Ans. (a) (i) If X was TT.

	T	T
T	TT	TT
T	TT	TT

All tall plants would be obtained.

If X was Tt.

	T	t
T	TT	Tt
T	TT	Tt

All tall plants would be obtained.

(ii) If X was TT.

	T	T
t	Tt	Tt
t	Tt	Tt

All tall plants would be obtained.

If X was Tt.

	T	t
t	Tt	tt
t	Tt	tt

1:1 ratio of tall:short plants.

(b) • (ii) would be helpful.

• In (ii), the ratios of offspring obtained were different for TT and Tt whereas in (i) the ratios were the same for TT and Tt so it would not be possible to determine whether X is TT or Tt based on (i).

CASE BASED QUESTIONS

Q.1. The most obvious outcome of the reproductive process is the generation but in sexual reproduction they may not be exactly alike. The resemblances as well as differences are marked. The rules of heredity determine the process by which



traits and characteristics are reliably inherited. Many experiments have been done to study the rules of inheritance.

- Why an offspring of human being is not a true copy of his parents in sexual reproduction?
- While performing experiments on inheritance in plants, what is

the difference between F_1 and F_2 generation? **COMPETENCY**

(c) Why do we say that variations are useful for the survival of a species over time? **COMPETENCY**

Ans. (a) An offspring of a human being is not an exact replica of their parents in sexual reproduction because it inherits half of its genetic material from each parent. During the formation of gametes, the genetic material undergoes a recombination process called crossing over.

(b) Difference table:

F_1 generation	F_2 generation
It is the first filial generation obtained by crossing two-two different parents.	It is the second filial generation obtained by self crossing the F_1 generation.

(c) Variation is essential for the survival of a species, as it enhances a species' adaptability to thrive and flourish in changing environmental conditions. Variant species assist in overcoming the challenges posed by extreme conditions in their surrounding environment, enabling them to thrive and reproduce, thus passing on their traits to the offspring.

Q.2. All human chromosomes are not paired. Most human chromosomes



have a maternal and a paternal copy, and we have 22 such pairs. But one pair called the sex chromosomes, is odd in not always being a perfect pair. Women have a perfect pair of sex chromosomes. But men have a mismatched pair in which one is normal sized while the other is a short on. [CBSE 2023]

(a) In humans, how many chromosomes are present in a Zygote and in each gamete?

(b) A few reptiles rely entirely on environmental cues for sex determination. Comment. **COMPETENCY**

(c) Why do all the gametes formed in human females have an X chromosome? **COMPETENCY**

Ans. (a) No. of chromosomes in human Zygote = 46 No. of chromosomes in human gamete : Sperm = 23 and Ovum = 23

(b) In some animals sex is not determined genetically but it is controlled by the environmental factors. For example, In a turtle, high incubation temperature leads to the development of female offsprings while in the lizard, high incubation results in male offsprings.

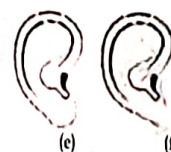
(c) A female has two X chromosomes, but no Y chromosomes. Therefore, all the female gametes i.e. ova will have only X chromosomes

Q.3. Figures (a) to (d) given below represent the type of ear lobes present in a family consisting of 2 children-Rahul, Nisha and their parents.

Excited by his observation of different types of ear lobes present in his family. Rahul conducted a survey of the type of ear lobes found [Figure (e) and (f) in his classmates. He found two types of ear lobes in his classmates as per the frequency given below.



(a) Rahul's Father (b) Rahul (c) Rahul's Mother (d) Rahul's sister Nisha



(f)

COMPETENCY

Sex	Free	Attached
Male	36	14
Female	31	19

On the basis of above data answer the following question:

(a) Which of the two characteristics free ear lobe or attached ear lobe appears to be dominant in this case? Why? **COMPETENCY**

(b) Is the inheritance of the free ear lobe linked with sex of the individual? Give reason for your answer.

(c) What type of ear lobe is present in father, mother, Rahul and his sister Nisha? Write the genetic constitution of each of these family members which explains the inheritance of this character in this family? **COMPETENCY**

(Gene for Free ear lobe is represented by F and gene for attached ear lobe is represented by f for writing the genetic constitution)

Ans. (a) Free ear lobe is dominant because it is found in a large majority of the population.

(b) No. It is not sex linked. As per the data of the family as well as the class, it is indicated that free ear lobe is present in males as well as in females.

(c) Father-Ff (free ear lobe), Mother - Ff (free ear lobe), Rahul - ff (attached ear lobe) and Nisha - Ff (free ear lobe)

Q.4. Sex determination is an important developmental event in the life cycle of all sexually reproducing plants. Recent studies of sex determination in many plant species, from ferns to maize, have been fruitful in identifying the diversity

of genetic and epigenetic factors that are involved in determining the sex of the flower or individual."

The above is an excerpt from an article by two scientists Cristina Juarez and Jo Ann Banks.

(a) What is the most likely genetic factor for sex determination in unisexual plants? **COMPETENCY**

(b) Epigenetic factors refer to factors external to the genetic component of an individual. Name evidence of ONE epigenetic condition that determines sexuality in animals.

(c) State Mendel's law of segregation and explain how sex determination violates the law.

Ans. (a) Sex chromosomes

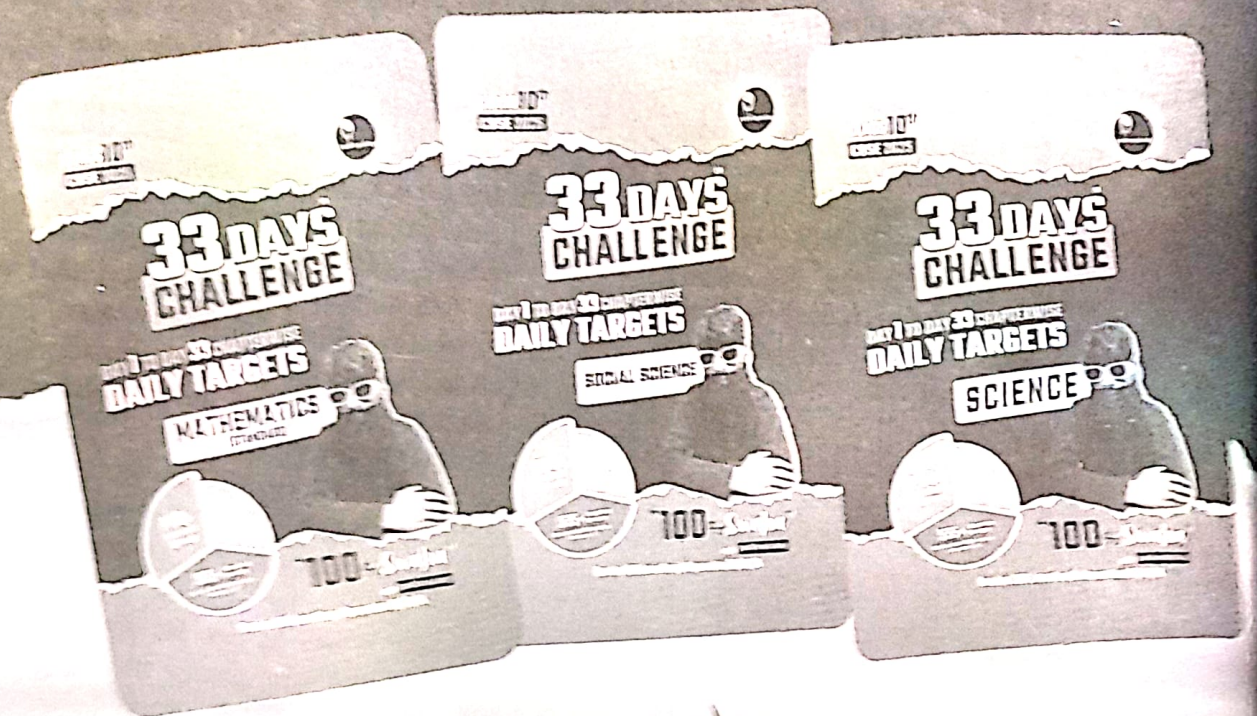
(b) Temperature of the fertilised egg determines sex of the embryo in some reptiles

(c) The law of segregation states that a diploid organism passes a randomly selected allele for a trait to its offspring, such that the offspring receives one allele from each parent.

- If sex determination in plants is governed by genetic factors, the offspring will get one copy of a gene from each parent.

- Sex determination violates the law of segregation as the human female does not have any copy of the Y-chromosomal genes.

(DAY 22 SWAHA)



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10

Control and Coordination



What did CBSE ask last year?

MCQs & A/R	No Questions asked
Subjective	—
	1 Short Question ($1 \times 3 = 3$ Marks)
	—
Case Based	1 Question ($1 + 1 + 2 = 4$ Marks)

Note: All the above typology of questions include 'Competency based Questions' labelled as

COMPETENCY

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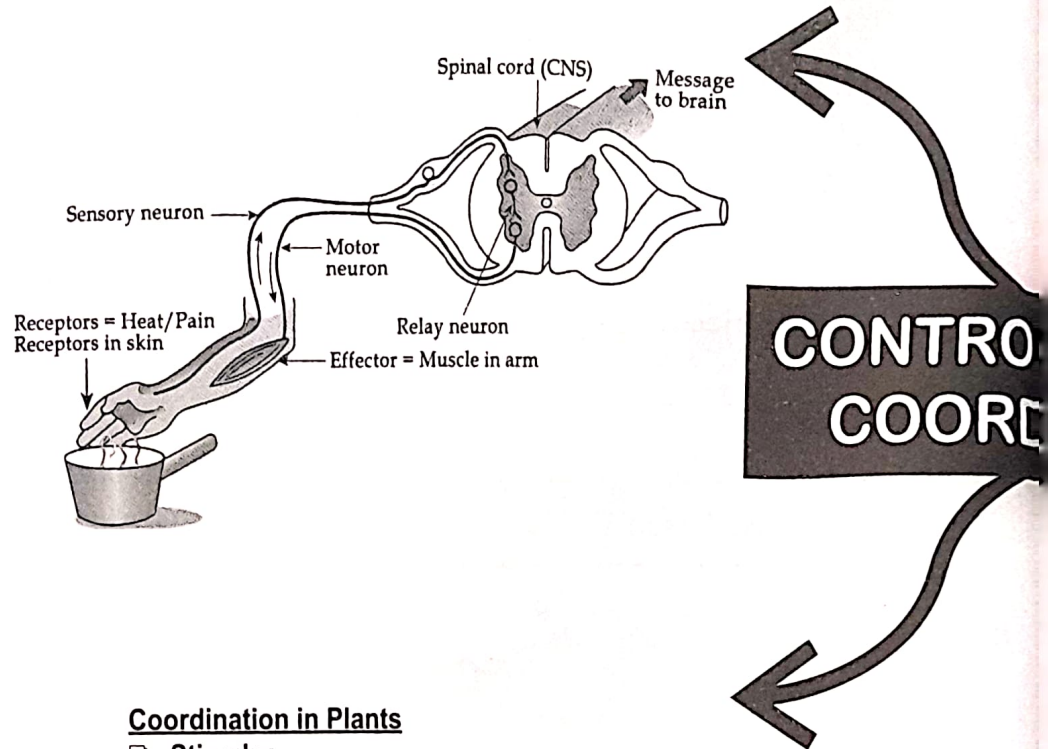
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Nervous System of Animals

- ☐ Structure of Neuron & Synapse
- ☐ Reflex Action
- ☐ Human Brain
- ☐ Nervous Protection
- ☐ Nervous Tissue action

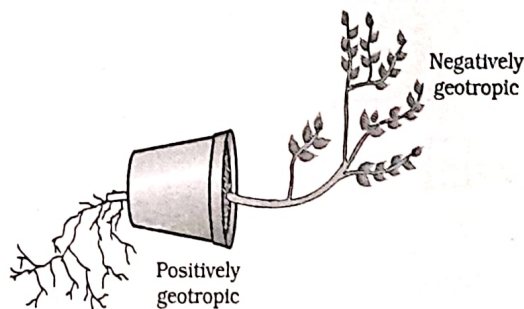
(Mechanism of reflex action is asked frequently)



Coordination in Plants

- ☐ Stimulus
- ☐ Movement due to Growth

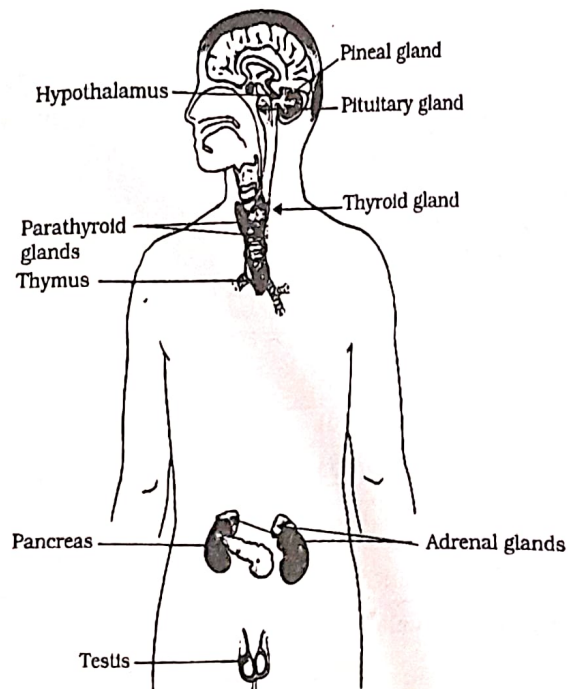
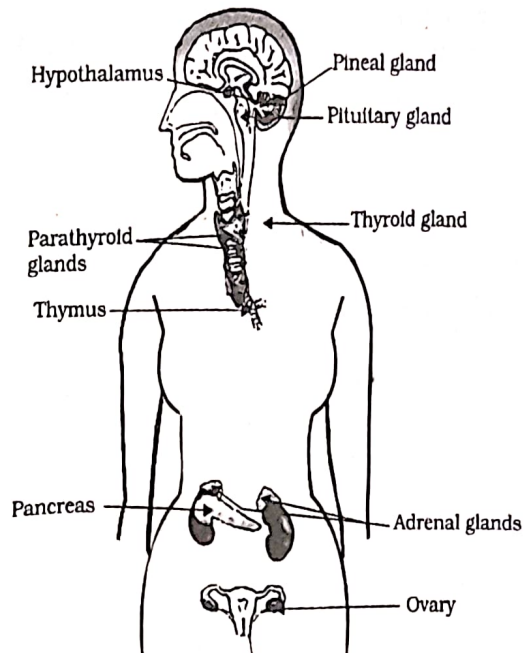
(Very short and short questions revolve around functions of several plants hormones)



Hormones in Animals

- ☐ Endocrine glands
- ☐ Hormonal diseases

(MCQs and very short questions cover the secretions and diseases very well)



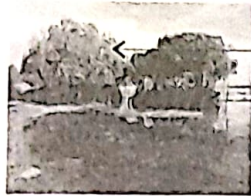
OBJECTIVE QUESTIONS

(DAY 23)

Multiple Choice Questions

Q.1. Pneumatophores are a special type of root found in mangrove trees. They help the trees by absorbing oxygen needed for the process of respiration in the roots.

COMPETENCY



Mangrove tree
Pneumatophores

Choose the statement/s that is/are TRUE about the movement exhibited by pneumatophores.

- P. They show negative geotropism as they grow against gravity.
Q. They show positive phototropism to absorb sunlight.
R. They show positive geotropism as the roots grow below the ground.
- (a) Only P (b) Only Q
(c) Both P and Q (d) Both Q and R
- Q.2. Walking in a straight line and riding a bicycle are the activities which are possible due to a part of the brain. Choose the correct location and name of this part from the given table.

COMPETENCY

	Part of the Brain	Name
(a)	Fore-brain	Cerebrum
(b)	Mid-brain	Hypothalamus
(c)	Hind-brain	Cerebellum
(d)	Hind-brain	Medulla/rhombencephalon

Q.3. Electrical impulse travels in a neuron from

COMPETENCY

- (a) Dendrite → axon → axonal end → cell body

- (b) Cell body → dendrite → axon → axonal end
(c) Dendrite → cell body → axon → axonal end
(d) Axonal end → axon → cell body → dendrite

Q.4. Which is the correct sequence of the components of a reflex arc?

[NCERT exemplar]

- (a) Receptors → Muscles → Sensory neuron → Motor neuron → Spinal cord
(b) Receptors → Motor neuron → Spinal cord → Sensory neuron → Muscle
(c) Receptors → Spinal cord → Sensory neuron → Motor neuron → Muscle
(d) Receptors → Sensory neuron → Spinal cord → Motor neuron → Muscle

Q.5. Which of the following statements are true?

COMPETENCY

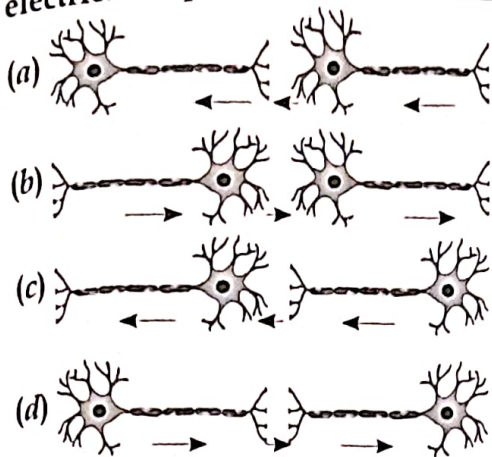
- (i) Sudden action in response to something in the environment is called reflex action
(ii) Sensory neurons carry signals from spinal cord to muscles
(iii) Motor neurons carry signals from receptors to spinal cord
(iv) The path through which signals are transmitted from a receptor to a muscle or a gland is called reflex arc
- (a) (i) and (ii) (b) (i) and (iii)
(c) (i) and (iv) (d) (i), (ii) and (iii)

Q.6. Which of the following statements are true about the brain?

COMPETENCY

- (i) The main thinking part of brain is hind brain
(ii) Centres of hearing, smell, memory, sight etc are located in fore brain.
(iii) Involuntary actions like salivation, vomiting, blood pressure are controlled by the medulla in the hind brain
(iv) Cerebellum does not control posture and balance of the body
- (a) (i) and (ii) (b) (i), (ii) and (iii)
(c) (ii) and (iii) (d) (iii) and (iv)

Q.7. electrical ...



Q.8. When a person is suffering from severe cold, he or she cannot

COMPETENCY

- (a) differentiate the taste of an apple from that of an ice cream
- (b) differentiate the smell of a perfume from that of an agarbatti
- (c) differentiate red light from green light
- (d) differentiate a hot object from a cold object

Q.9. Person X met with an accident and injured a part of the hind brain.

Identify the function that is most likely to be affected due to the injury.

COMPETENCY

- (a) Display of emotions
- (b) Walking in a straight line
- (c) Regulation of blood pressure
- (d) Maintenance of body temperature

Q.10. There was a cerebellar dysfunction in a patient. Which of the following activities will get disturbed in this patient as a result of this?

COMPETENCY

- (a) Salivation
- (b) Hunger control
- (c) Posture and balance
- (d) Regulation of blood pressure

Q.11. Auxin is a plant hormone that promotes cell elongation and is produced by the apical meristem. It inhibits the growth of lateral buds which are present at nodes (where leaves attach to the

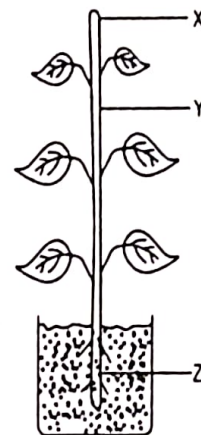
produced by the apical meristem, the lateral buds remain dormant.

A gardener wants the plants in the hedge that he is growing to become bushier with more branches, Which of the following should he do?

COMPETENCY

- (a) spray water on the tips of the stems to increase growth
- (b) dig around the plant roots and apply more manure
- (c) trim the hedge by cutting off the tips of the stems
- (d) remove all the weeds that grow around the hedge

Q.12. Given figure shows a plant in which auxin is synthesised at part X of the plant. Geeta took the potted plant and cut off part X. She then took the plant and kept it near a window with sunlight and observed it after 7 days Which of the following is she likely to have observed?



COMPETENCY

- (a) Part Y grew and bent towards the window.
- (b) Part Z started growing upwards and out of the soil.
- (c) Part Y did not grow at all.
- (d) Part Y grew upwards

Q.13. The growth of tendril in pea plants is due to

COMPETENCY

- (a) effect of light
- (b) effect of gravity
- (c) rapid cell divisions in tendrillar cells that are away from the support
- (d) rapid cell divisions in tendrillar cells in contact with the support

Q.14. A plant 'X' is placed in a closed box and is left unwatered for 15 days. Identify the plant hormone that is most likely to be released and the reason for it.

COMPETENCY

- (a) Auxins are released in response to the absence of light.
- (b) Cytokinins are released to enhance the growth of the shoot.
- (c) Absciscic acid is released in response to the scarcity of water.
- (d) Gibberellins are produced in response to the absence of water.

Q.15. Sapna suffers from a condition due to which her average blood sugar level is 174 mg/dL. The average blood sugar level in a healthy adult is < 140 mg/dL.

COMPETENCY

- (a) Which of the following could be the cause of Sapna's condition?
- (b) insufficient production of thyroxine in her body insufficient production of insulin in her body
- (c) excess production of thyroxine in her body
- (d) excess production of insulin in her body

Q.16. Rajesh noticed that a potted plant kept in the window of his room shows bending towards sunlight. This could be due to:

- (a) More growth in the well lit region due to diffusion of auxin hormone
- (b) More growth in the region away from light due to diffusion of auxin hormone
- (c) More growth in the well-lit region due to diffusion of cytokinin hormone
- (d) More growth in the region away from light due to diffusion of cytokinin hormone

Q.17. A doctor advised a person to take an injection of insulin because

[NCERT exemplar]

- (a) his blood pressure was low
- (b) his heart was beating slowly
- (c) he was suffering from goitre
- (d) his sugar level in blood was high

Q.18. Which statement is not true about thyroxin?

COMPETENCY

- (a) Iron is essential for the synthesis of thyroxin
- (b) It regulates carbohydrates, protein and fat metabolism in the body
- (c) Thyroid gland requires iodine to synthesise thyroxin
- (d) Thyroxin is also called thyroid hormone

Q.19. Select the mis-matched pair

[NCERT exemplar]

- (a) Adrenaline: Pituitary gland
- (b) Testosterone: Testes
- (c) Estrogen: Ovary
- (d) Thyroxin: Thyroid gland

— Assertion Reason Questions —

Following questions consist of two statements: Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

- (a) Both A and R are true, and R is the correct explanation of A.
- (b) Both A and R are true, and R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

Q.1. Reason: All information from our environment is detected by the specialised tips of some nerve cells.

Assertion: These receptors are usually located in our sense organs such as gustatory receptors will detect taste and olfactory receptors will detect smell.

COMPETENCY

Q.2. Reason: The communication between the central nervous system and the other parts of the body is facilitated by the peripheral nervous system.

Reason: The peripheral nervous system consists of spinal nerves arising from brain.

Q.3 Assertion: Hind-brain consists of pons, medulla and cerebellum.

Reason: Examples of voluntary action are blood pressure, salivation and vomiting.

Q.4 Assertion: The plants also use electrical-chemical means to convey this information from cell to cell, but unlike in animals, there is no specialised tissue in plants for the conduction of information.

Reason: Plant cells change shape by changing the amount of water in them, resulting in swelling or shrinking, and therefore in changing shape. **COMPETENCY**

Q.5. Assertion: There are limitations to the use of electrical impulses.

Reason: Electrical impulses will reach only those cells that are connected by nervous tissue, not each and every cell in the animal body. **COMPETENCY**

Q.6. Assertion: Hypothalamus plays an important role in growth of human beings.

Reason: The hypothalamus releases growth hormone releasing factor which stimulates the pituitary gland to release growth hormone.

Q.7. Assertion: Iodine is necessary for the thyroid gland to make thyroxine hormone.

Reason. The deficiency of thyroxine hormone can cause disease called AIDS **COMPETENCY**

ANSWERS

Multiple Choice Answers

1. (a) 2. (c) 3. (c) 4. (d)
5. (c) 6. (c) 7. (c) 8. (b)
9. (b)
10. (c) A patient with cerebellar dysfunction may have difficulty with activities that require coordination, balance or gait such as speaking or walking.
11. (c) **Explanation.** By cutting off the tip gardener ensures that the apical meristem are removed, which is responsible for producing auxin and inhibiting the growth of lateral buds. Without the apical dominance caused by auxin, the lateral buds will be stimulated to grow,

resulting in a bushier appearance with more branches.

12. (c) **Explanation.** Plant hormones (auxin) induce apical dominance and stimulate the uppermost growth of the shoot. So when she trimmed the area containing these hormones, the upper growth was inhibited. Consequently, Part Y failed to develop at all."
13. (c) 14. (c) 15. (b) 16. (b)
17. (d) **Explanation.** The doctor recommended an individual to receive an insulin injection as their blood sugar level was elevated as insulin hormone will lowers the glucose level.
18. (a) 19. (a)

Assertion-Reason Answers

1. (a) Both A and R are true, and R is the correct explanation of A.
2. (c) A is true but R is false.
3. (d) A is false but R is true.
4. (b) Both A and R are true, and R is not the correct explanation of A.
5. (a) Both A and R are true, and R is the correct explanation of A.
6. (a) Both A and R are true, and R is the correct explanation of A.
7. (c) A is true but R is false.

Explanation: The first part of the assertion is accurate in stating that iodine is necessary for the thyroid gland to produce thyroxine hormone, the second part is incorrect. Thyroxine deficiency can lead to a condition known as hypothyroidism, but it is not related to AIDS in any way. It's important to ensure accuracy when discussing medical conditions and their causes.

SUBJECTIVE QUESTIONS

— Very Short Answer Questions —

Q.1. Name the sensory receptors found in the nose and on the tongue. [CBSE 2012]

Ans. (i) Olfactory receptors are found in the nose to detect smell
(ii) Gustatory receptors are found in the tongue to detect taste

Q.2. In animals, hormones can be secreted by one organ and can act on multiple organs. Justify this statement by explaining the effect of a single animal hormone on three organs.

Ans. • Adrenaline induces the sweat glands to produce more sweat.
• It acts on the heart to increase the contraction of its muscles/pumping causing improved oxygen delivery.
• It acts on blood vessels of the digestive system constricting them.

Q.3. While watering a rose plant, a thorn pricked Rita's hand. How would she respond to this situation? Provide the term for such type of response.

[CBSE 2012]

Ans. She will immediately retract her hand. The name of this response is "Reflex Action."

Q.4. Name the part of brain which is responsible for the following actions:

- (i) Maintaining posture and balance
- (ii) Beating of heart
- (iii) Thinking
- (iv) Blood pressure

[CBSE 2023]

Ans. (i) Maintaining posture and balance = Cerebellum

(ii) Beating of heart = Medulla

(iii) Thinking = Cerebrum

(iv) Blood pressure = Medulla

Q.5. Where are auxins synthesized in a plant? Which organ of the plant shows

(i) Positive phototropism

(ii) Negative geotropism

(iii) Positive hydrotropism

COMPETENCY

Ans. Auxin is produced in young shoots, buds, young leaves, and roots, where

growth takes place through cell elongation and is enhanced by the presence of sunlight.

(i) Positive phototropism → Plant stem

(ii) Negative geotropism → Plant stem

(iii) Positive hydrotropism → Plant roots

Q.6. Name one plant hormone which inhibits growth. Write its one more function. [CBSE 2023]

Ans. Absciscic acid is a plant hormone which functions mainly as a growth inhibitor. It promotes the dormancy in seeds and buds.

Q.7. The two pictures below illustrate tropism in plants. P shows a plant bending towards light. Q shows a plant twining around a pole. **COMPETENCY**



P. Plant bending towards light



Q. Plant twining around a pole

Based on the pictures, what is true about the growth rate of the plant cells on the side away from the stimulus as compared to the growth rate of the plant cells on the side towards the stimulus?

Ans. The cells on the side away from the stimulus grow faster than the cells on the side of the stimulus.

Q.8. Name the gland and the hormone secreted by the gland, which are associated with the following problems:

(i) a girl has grown extremely tall.

(ii) a woman has a swollen neck.

[CBSE 2019]

Ans. (i) Pituitary gland releases human growth hormone.

(ii) Thyroid gland produces thyroxine hormone.

Q.9. Why is the use of iodised salt advisable?

COMPETENCY

Ans. Iodine is essential for the thyroid gland to produce the thyroxine hormone. Thyroxine plays a role in regulating carbohydrate, protein, and fat metabolism in the body to maintain an optimal balance for growth. When iodine is lacking in our diet, there is a risk of developing goitre. In such cases, the thyroid gland enlarges, resulting in swelling in the neck. Iodized table salt contains an appropriate amount of iodine. Therefore, to prevent iodine deficiency, it is advisable to use iodized salt.

(DAY 24)

Short Answer Questions

Q.1. Raghav was watching Nia and made the following observation:

Nia was practicing boxing. As her opponent swung an arm, Nia blinked her eyes and ducked down. Nia retaliated with a punch.

(a) Raghav said that the blinking of eyes and ducking down are both reflex actions. Is he correct? Justify.

(b) Explain the nervous process involved in Nia's retaliation with a punch in TWO points. **COMPETENCY**

Ans. (a) – Blinking of eyes is not a reflex action. It is an involuntary action that happens with or without a stimulus.

– Nia ducked down because of reflex action.

(b) – Nia's brain received the signal from the eyes through sensory nerves, and the brain processed this signal.

– The brain sent the signal to the hand, through motor nerves to punch back.

Q.2. The thyroid hormone controls the body's metabolism. The two main hormones thyroid releases are thyroxine (T₄) and triiodothyronine (T₃), which collectively comprise the thyroid hormone. The thyroid-stimulating hormone (TSH) in the pituitary gland stimulates the thyroid to release the hormones.

Ram lives in a remote part of a Himalayan village. He visited the doctor with symptoms of tightness in the throat and a hoarse voice. The doctor asked for a thyroid profile and blood sugar test.

Given below are the test results:

Test	Normal/Reference range	Amount in sample
TSH	0.4-5 mIU/L	6 mIU/L
T ₃	4.6-12 µg/dL	1.76 µg/dL
T ₄	80-180 ng/dL	21 ng/dL
Blood sugar (post-meal)	170-200 mg/dL	180 mg/dL

(a) What could be the deficiency disease Ram maybe suffering from? Justify.

(b) State TWO reasons why the doctor prescribed a thyroid test.

[CBSE 2024]

Ans. (a) • The deficiency disease is Goitre.

• T₃ and T₄ level for Ram is less than the given normal range while TSH is high.

(b) • The geographical location of Ram indicated the possibility of low levels of Iodine availability in food.
• The symptoms described indicate iodine deficiency.

Q.3. (a) An old man is advised by his doctor to take less sugar in his diet. Name the disease from which the man is suffering. Mention the hormone due to imbalance of which he is suffering from this disease. Which endocrine gland secretes hormone?

(b) Name the endocrine gland which secretes growth hormone. What will be its effect on a person of

(i) Deficiency of growth hormones?

(ii) Excess secretion of growth hormones? **COMPETENCY**

Ans. (a) The man is suffering with the condition of diabetes. The hormone responsible for this condition is insulin, which is secreted by the pancreas.

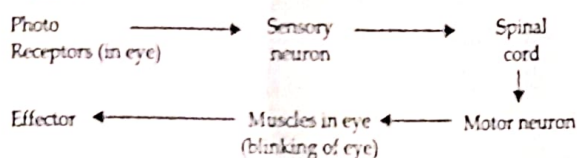
(b) The gland responsible for secreting the growth hormone is the pituitary gland.

(i) A deficiency of the growth hormone leads to Dwarfism.

(ii) An excess secretion of the growth hormone results in Gigantism in an individual.

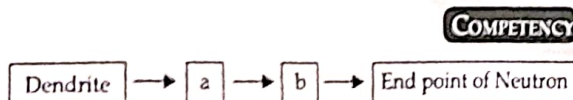
Q.4. Trace the sequences of events through a reflex arc which occur when a bright light is focused on your eyes.

Ans.



Q.5. Name one gustatory receptor and one olfactory receptor present in human beings.

Write *a* and *b* in the given flow chart of neuron through which information travels as an electrical Impulse.



Ans. Gustatory receptor present on tongue detects taste and olfactory receptor present in the nose detects smell.

a → Cell body

b → Axon

Q.6. How is an electric impulse created in human nervous system? Identify the parts of a neuron which helps the nerve impulse to travel

(a) towards the cell body

(b) away from the cell body [CBSE 2020]

Ans. The receptor in a sense organ is in touch with the dendrites of sensory neuron when a stimulus acts on the receptor, a chemical reaction is set off which produces an electrical impulse in it.

(a) Neuron which helps the nerve impulse to travel towards the cell body is Dendrite.

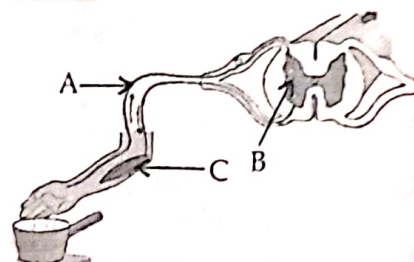
(b) Neuron which helps the nerve impulse to travel away from the cell body is Axon.

Q.7. In the given diagram –

(i) Name the parts labelled A, B and C.

(ii) Write the functions of A and C.

(iii) Reflex arcs have evolved in animals? Why? **COMPETENCY**



Ans. (i) A = Sensory neuron; B = Relay neuron; C = Effector (muscle in arm)

(ii) *Function of A:* Sensory neuron conveys impulses from sensory cells (or receptors) to the central nervous system (spinal cord and brain).

The effector (muscle of the arm) reacts to the stimulus when the motor neuron conveys the impulse to the effector (muscle of the arm).

(iii) Reflex arcs have evolved in animals because the cognitive processes in the animal brain are not rapid enough, and reflex arcs continue to be more efficient for their swift responses.

Q.8. 'Brain and spinal cord are two vital organs of our body.' How is our body designed to protect them? **COMPETENCY**

Ans. The brain is enclosed within a protective bony enclosure and is surrounded by a fluid-filled sac that shields it from shocks. The spinal cord is safeguarded by the vertebral column, while both the brain

and spinal cord are further protected by layers known as meninges and a protective fluid called cerebrospinal fluid (CSF).

Q.9. Some plants like pea plants have tendrils which help them to climb up other plants. Explain how is it done. Name the plant hormone responsible for this movement. [CBSE 2018]

Ans. Auxin is a plant hormone synthesized at the shoot's tip, aiding in cell elongation. Tendrils possess cells capable of detecting contact with a nearby solid support. When a tendril makes contact with an object, the side of the tendril touching the object grows more slowly than its opposite side. This differential growth causes the tendril to bend towards the object, extend and wind around it, ultimately clinging to the object. This winding motion of a plant's tendril, such as in peas, around a nearby object provides support to the plant, especially if it has a weak stem.

Q.10. Given below are some disorders noticed in some patients. It could be due to malfunctioning of which part of brain:

- (a) Loss of sensation of feeling full
- (b) Lowered ability to salivate
- (c) Difficulty in maintaining the posture and balance in body

Ans. (a) Fore brain
(b) medulla in hind-brain
(c) Cerebellum

Q.11. What is feedback mechanism of hormonal regulation? Take the example of insulin to explain this phenomenon [CBSE 2023]

Ans. The process by which the timing and quantity of hormone release by the glands in our body is regulated is referred to as the feedback mechanism of hormonal regulation. The timing and quantity of hormones released by various glands are managed by the 'feedback mechanism' inherently present in our body. For example, when

the blood sugar level rises excessively, it is sensed by the pancreas cells, which react by generating and releasing more insulin into the bloodstream. As the blood sugar level declines to a specific point, the secretion of insulin is automatically diminished.

Q.12. Name the hormones secreted by the following endocrine glands and specify one function of each:

- (a) Thyroid
- (b) Pituitary
- (c) Pancreas

Competency

Ans.

	Gland	Hormone	Pancreas
(a)	Thyroid	Thyroxine	It controls the rate of metabolism of fats, carbohydrates and protein.
(b)	Pituitary	Growth hormone	It controls the growth of human body like development of bones and muscles.
(c)	Pancreas	Insulin	It lowers the blood sugar level of the body.

(DAY 25)

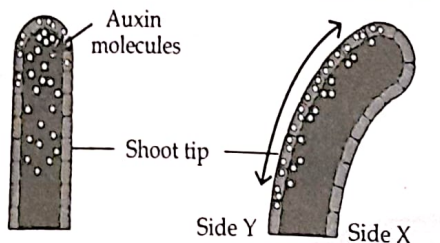
Long Answer Questions

Q.1. Define reflex action. State its significance. [CBSE 2015]

Ans. A reflex action denotes an automatic response triggered by a stimulus. It represents the most basic form of reaction within the nervous system. This rapid and involuntary response occurs without the conscious control of the brain and is therefore considered involuntary. The route followed by nerve impulses during a reflex action is termed the reflex arc. Reflex actions are instinctual actions performed for self-protection without conscious thought. For instance, coughing is a reflex action that clears the windpipe, while the pupils of our eyes constrict in bright light to safeguard the retina from excessive light exposure. Conversely,

the pupils dilate in dim light conditions to enhance vision in reduced light levels.

- Q.2. (a) What is the role of auxin in a plant?
 (b) What should be the direction of light for the shoot tip to bend toward a side as given in the image below?



- (c) Describe the mechanism involved in the bending of a shoot tip due to stimulation by light.

Ans. (a) Auxin in the plant promotes:

- cell growth
- cell elongation.

- (b) The light source should be at Side X for the shoot tip to bend.

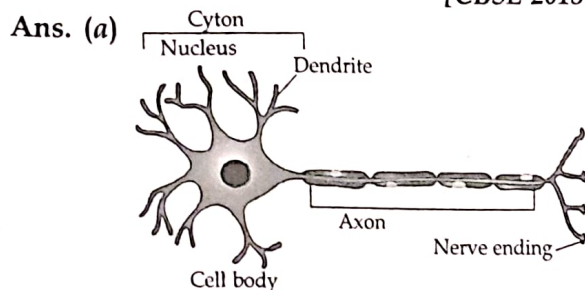
- (c) • When the light comes from one side of the plant, then the plant hormone auxin gets diffused towards the side of the shoot that is away from sunlight.

- This concentration of auxin stimulates cell growth and elongation on the side of the shoot away from light.

- Q.3. (a) Draw the structure of a neuron and label the following on its Nucleus, Dendrite, Cell body and Axon.

- (b) Name the part of neuron
 (i) Where information is acquired.
 (ii) Through which information travels as an electrical impulse.

[CBSE 2013]



- (b) (i) Dendrite
 (ii) Axon

- Q.4. Give the function (s) of the following plant hormones [CBSE 2014, 15]

- (a) Auxins, (b) Gibberellins
 (c) Cytokinins (d) Absciscic acid,
 (e) Ethylene

Ans. (a) Auxins play a role in stimulating cell elongation, root development, cell division, and even contribute to fruit enlargement.

- (b) Gibberellins, on the other hand, encourage stem elongation, seed sprouting, and the initiation of the flowering process.

- (c) Cytokinins are involved in breaking the dormancy of seeds and buds. Additionally, they have the ability to postpone the aging of leaves and facilitate the opening of stomata.

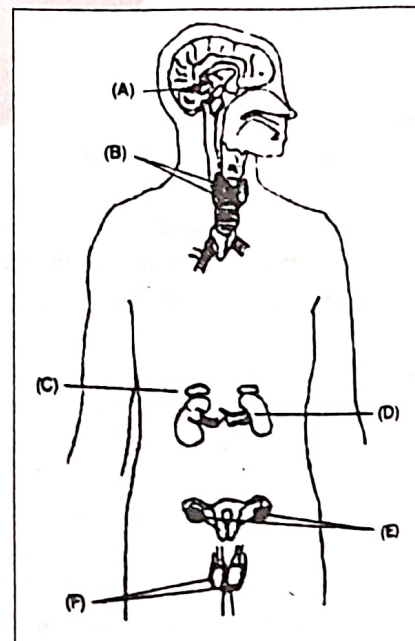
- (d) Absciscic acid is responsible for triggering the shedding of leaves and fruits.

- (e) Ethylene, in its part, facilitates the ripening of fruits.

- Q.5. (a) Identify the endocrine glands A, B, C, D, E and F in the given diagram.

- (b) List the functions of parts D and F.

[COMPETENCY]



Ans. (a) A - Pituitary,
B - Thyroid,
C - Adrenal,
D - Pancreas,
E - Ovaries (in female),
F - Testis (in male).

(b) The pancreas secretes insulin, which regulates the level of sugar in the blood. The testes secrete testosterone, which governs sperm production and the development of secondary sexual characteristics.

Q.6. Give reasons:

(a) Pituitary is often termed as master endocrine gland.

(b) Pancreas helps in digestion and also regulates blood sugar level.

(c) Adrenals are known as glands of emergency. [CBSE 2014]

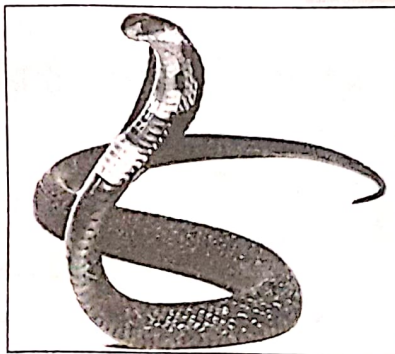
Ans. (a) The pituitary gland is often referred to as the master endocrine gland because it harmonizes and control the secretion of all the other endocrine glands.

(b) The pancreas performs a dual function by secreting pancreatic juice and a hormone known as insulin. Pancreatic juice aids in digestion, while insulin regulates blood sugar levels.

(c) Adrenalin is directly released into the bloodstream, where it is transported to various parts of the body. It primarily affects the heart, causing it to beat faster to supply more oxygen to our muscles. This heightened activity leads to the contraction of small arteries surrounding the digestive system and skin, reducing blood flow to these areas. Consequently, blood is redirected to our skeletal muscles. The rate of breathing also increases due to the contractions of the diaphragm and rib muscles. All these responses collectively prepare the animal body to cope with the situation.

CASE BASED QUESTIONS

Q.1. Sheila saw a snake and instantly jumped back. She then slowly moved away from the snake.



(a) What is the difference between the two actions of instantly jumping and walking away? **COMPETENCY**

(b) Which part of brain control voluntary actions? **COMPETENCY**

(c) Which type of action occurs when Sheila sees a snake, and provide another example of that action?

Ans. (a) The jump was an involuntary quick reflex action while walking away was a voluntary slow action.

(b) Fore-brain is responsible for voluntary actions.

(c) A reflex action occurs when Sheila sees a snake, and an example of a reflex action is when a person touches a hot object and immediately withdraws their hand.

Q.2. Hema bought some unripe tomatoes and left half of them in a brown paper bag and the other half in an open tray. After two days she noticed that the

tomatoes in the paper bag had ripened, but the ones in the open tray had not.



- (a) What hormone facilitated the ripening of tomatoes? **COMPETENCY**
 (b) Why did the tomatoes in the paper bag ripen faster? **COMPETENCY**
 (c) Name one growth inhibitor and growth promoter hormones in plant?

Ans. (a) Ethylene

- (b) Ethylene is a gaseous hormone and the paper bag prevents it from diffusing into the air. Hence the tomatoes ripened faster.
 (c) Absciscic acid is a growth inhibitor hormone while auxin is growth promoter hormone

Q.3. While sitting in a park, Sandeep sees some children playing with a plant that closes its leaves after being touched. He becomes curious and also touches the plant to see the action. After some research, he found out the name of the plant is the touch-me-not plant.



- (a) To which family does the touch-me-not plant belong? **COMPETENCY**

- (b) How does the touch-me-not plant close its leaves immediately?

COMPETENCY

- (c) Do plants have a nervous system like humans to convey information?

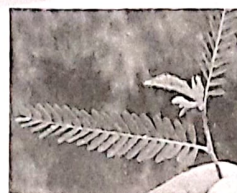
Ans. (a) Mimosa

- (b) The plant cells change shape by altering the amount of water in them, resulting in swelling or shrinking, and therefore changing shapes.
 (c) No, plants do not have a nervous system, but they do have electrical-chemical means to convey information from cell to cell. Unlike animals, there is no specialized tissue in plants for the conduction of information.

Q.4. Mohan and Rohit observed that shoots of a plant growing in shade bend towards the sunlight. Whereas, leaves of 'Touch me not' plant fold and droop soon after touching. They were curious to know how these movements occur in plants. [2024 CBSE]



A. Shoots of a plant bending towards light



B. Folding leaves of Touch me not plant

In order to help them understand the movements in the plants, answer the following questions:

- A. What causes the bending of shoots in the plants as shown in figure A?

B. What causes the folding of the leaves in 'Touch me not' plant as shown in figure B?

C. Compare the movement of growth of the pollen tube towards ovule with the movements shown in part A of the given figure.

D. Compare the movement shown in figure B with the movement of body parts in the animals. **COMPETENCY**

Ans. A. *Causes of Shoots of a plant bending towards light.*

- Bending of shoots of plants is a response to the stimulus and a directional, growth-related movement.
- When growing plants detect sunlight, a hormone called auxin, synthesized at shoot tip helps the cells to grow longer.
- When light is coming from one side of the plant, auxin diffuses to the shady side of the shoot.
- This concentration of auxin stimulates the cells of the shoot to grow longer on the side of the shoot which is away from the light. Thus, plant appears to bend towards light.

B. *Causes of Folding leaves of touch-me-not plant:*

- Leaves of *Touch-me-not* plant respond to the stimulus by showing growth independent movement.

- These plants use electrical-chemical means to convey the information from cell to cell.

- Movement happens at a point different from the point of touch.

- Plant cells change shape by changing the amount of water in them, resulting in swelling or shrinking, and therefore in changing shape.

C. Growth of pollen tubes towards the ovule is an example of *chemotropism* whereas bending of shoots towards sunlight is an example of *phototropism*.

D. *Comparison of movement in folding the leaves of touch-me-not plants with the movement of body parts in the animals.*

(i) Although both plants and animals show electrical-chemical means to convey the information from cell to cell but unlike nerve cells in animals there is no specialized tissue in plants for conduction of information.

(ii) In animal cells, change in shape occurs because of the specialized proteins found in muscle cells; plant cells change shape by changing the amount of water in them.

(DAY 25 SWAHA)



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11

Our Environment



What did CBSE ask last year?

MCQs & A/Rs	2 Questions ($2 \times 1 = 2$ Marks)
Subjective	No Very Short Questions asked
	1 Short Question ($1 \times 3 = 3$ Marks)
	No Long Questions Asked
Case Based	No Case Based Questions Asked

Note: All the above typology of questions include 'Competency based Questions' labelled as **COMPETENCY**.

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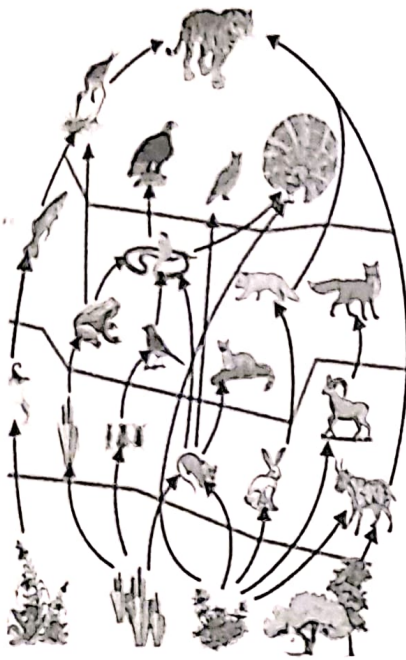


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Ecosystem-What are its components?

□ Food chains & Food Webs



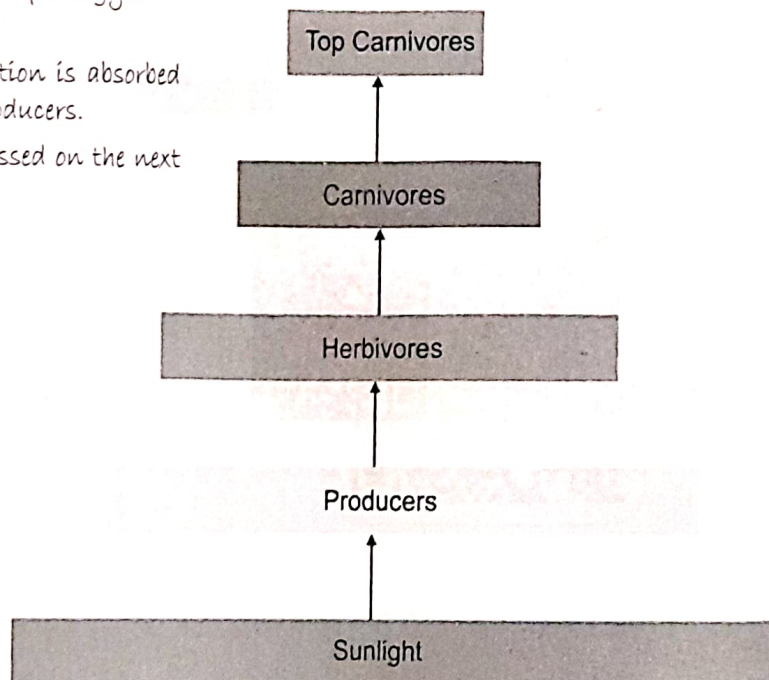
OUR E

□ Energy Flow

Questions are based on the flow of energy in an ecosystem.

1% rule: Only 1% solar radiation is absorbed by all green plants, i.e., the producers.

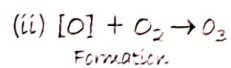
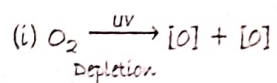
Only 10% of the energy is passed on the next higher level beyond producers.



ENVIRONMENT

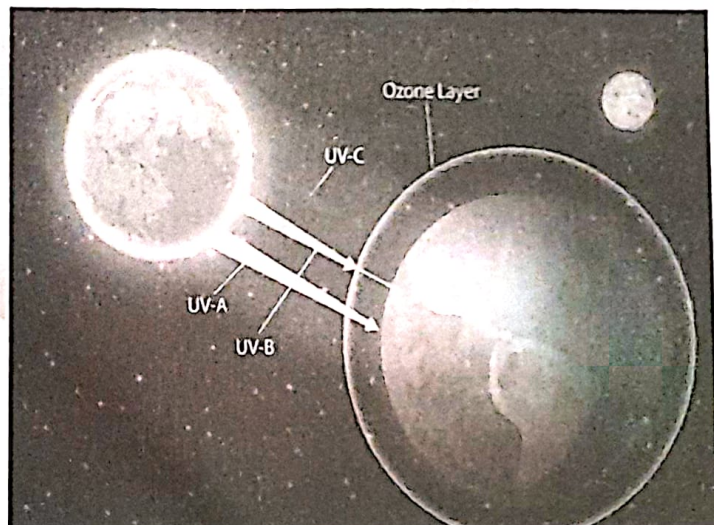
How do our activities affect the environment?

❑ Ozone Layer



❑ The Garbage Management

Short and long questions revolve around the measures one should practice for waste management.



OBJECTIVE QUESTIONS

(DAY 26)

Multiple Choice Questions

- Q.1. The percentage of solar radiation absorbed by all the green plants for the process of photosynthesis is about
(a) 1% (b) 5 %
(c) 8 % (d) 10 %

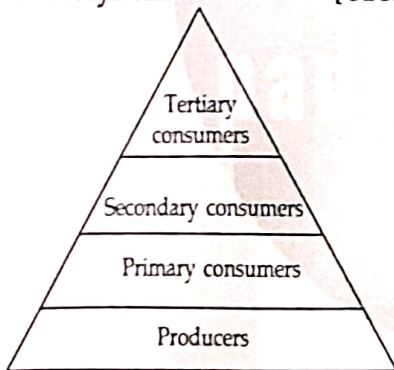
- Q.2. Given below are some biotic and abiotic components of an ecosystem. rock, rainfall, sunlight, mango tree, rabbit

Which of these components can continue to exist in the absence of the other component/s?

COMPETENCY

- (a) Only sunlight
(b) Only rock and sunlight
(c) Only mango tree and rabbit
(d) Only rock, sunlight and rainfall

- Q.3. Shown below are the trophic levels of an ecosystem. [CBSE 2024]



In which of the levels can an omnivore be present?

- (a) Only secondary consumers
(b) Only secondary and tertiary consumers
(c) Only primary and secondary consumers
(d) Only primary, secondary and tertiary consumers
- Q.4. If the total energy at the trophic level of producers in an ecosystem is 'E', then which of the following corresponds

to the energy available to the tertiary consumers?

COMPETENCY

- (a) $E/10$ (b) $10 \times E$
(c) $E/1000$ (d) $1000 \times E$

- Q.5. Biological magnification is the increase in concentration of certain substances in the tissues of organisms at successively higher levels in a food chain.

Which of the following could the increase be a result of?

COMPETENCY

P. Inability of environmental processes to break down the substance.

Q. High rate of excretion of the substance by the organism.

R. Low rate of internal degradation of the substance by organisms.

- (a) Only P
(b) Only P and R
(c) Only Q and R
(d) All - P, Q and R

- Q.6. In the given food chain, suppose the amount of energy at fourth trophic level is 5 kJ, what will be the energy available at the producer level?

Grass → Grasshopper → Frog → Snake → Hawk

- (a) 5 kJ (b) 50 kJ
(c) 500 kJ (d) 5000 kJ

- Q.7. Which of the following describes the flow of energy and nutrients, respectively, through the ecosystem?

COMPETENCY

- (a) bidirectional and cyclic
(b) cyclic and bidirectional
(c) unidirectional and cyclic
(d) cyclic and unidirectional

- Q.8. The energy available at each trophic level gets ___ progressively due to loss of energy at each level

COMPETENCY

- (a) Increase
(b) Diminished
(c) Depends on the trophic level
(d) None of these

Q.9. Depletion of ozone layer is mainly due to

- (a) chlorofluorocarbon compounds
- (b) carbon monoxide
- (c) methane
- (d) pesticides

Q.10. Excessive exposure of humans to UV rays results in.

- (i) damage to immune system
 - (ii) damage to lungs
 - (iii) skin cancer
 - (iv) peptic ulcers
- [CBSE 2024]
- (a) (i) and (ii)
 - (b) (ii) and (iv)
 - (c) (i) and (iii)
 - (d) (iii) and (iv)

Q.11. In the following groups of materials, which group(s) contains only non-biodegradable items?

COMPETENCY

- (i) Wood, paper, leather
 - (ii) Polythene, detergent, PVC
 - (iii) Plastic, detergent, grass
 - (iv) Plastic, bakelite, DDT
- (a) (iii)
 - (b) (iv)
 - (c) (i) and (iii)
 - (d) (ii) and (iv)

Q.12. In which year did the amount of ozone in the atmosphere begin to drop sharply?

COMPETENCY

- (a) 1999
- (b) 1980
- (c) 2023
- (d) 1809

— Assertion Reason Questions —

Following questions consist of two statements: Assertion (A) and Reason (R).

Answer these questions selecting the appropriate option given below:

- (a) Both A and R are true, and R is the correct explanation of A.
- (b) Both A and R are true, and R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

Q.1. Assertion: Decomposers play an important role in our environment.

Reason: Decomposers break down the dead remains and waste products of organisms and help recycle nutrients

Q.2. Assertion: Ozone is formed by three atoms of oxygen.

Reason: CFCs cause harm to ozone present in our atmosphere

Q.3. Assertion: Incineration is a process by which household liquid waste is destroyed.

Reason: Incineration involves burning waste material at a very high temperature.

ANSWERS

— Multiple Choice Answers —

- 1. (a) 2. (b) 3. (d) 4. (c)
- 5. (b)
- 6. (d)

Explanation. In the provided food chain, if the energy amount at the fourth trophic level is 5KJ, then the energy available at the producer level will remain 5000KJ. Since only 10% of the energy is passed on to the next higher trophic level beyond producers, 500 KJ of energy will be retained in the grasshopper's body, with 50 KJ stored in the frog. The snake's body will contain 5 KJ of energy, while the hawk's body will hold 0.5 KJ.

- 7. (c) 8. (b) 9. (a) 10. (c)
- 11. (d) 12. (b)

— Assertion-Reason Answers —

- 1. (a) Both A and R are true, and R is the correct explanation of A.
- 2. (b) Both A and R are true, and R is not the correct explanation of A.
- 3. (d) A is false but R is true.

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Q1. How is energy flowing in the ecosystem?
 (a) The energy flows from the sun to the producers (plants) and then to the consumers (animals).
 (b) The energy flows from the producers to the consumers.

Ans. (a) The energy flows from the sun to the producers (plants) and then to the consumers (animals).
 (b) The energy flows from the producers to the consumers.

(a) The energy captured by the autotrophs does not revert back to the sun and the energy that passes to the heterotrophs does not return to the autotrophs. As it moves progressively through the various trophic levels, it is no longer available to the previous level.

Q4. A terrarium contains soil and a variety of plants inside a glass container. It is watered and sealed. The soil gives the required nutrients, and plants use the carbon dioxide present in the air inside the container to prepare food using sunlight.



(a) Can this terrarium be called an ecosystem? Give a reason.

(b) List the biotic and abiotic components of this ecosystem.

Ans. (a) The terrarium cannot be called an ecosystem because all the components of the ecosystem are not interacting with each other.

- (b) • The biotic components are the variety of plants and other organisms present in the ecosystem.
• The abiotic components are soil, sunlight, air and water.

Q.5. In a food chain, if 10,000 joules of energy is available to the producer, how much energy will be available to the secondary consumer to transfer it to the tertiary consumer? [CBSE 2012]

Ans. For producers, the energy level is 10,000 J. The energy transferred from producers to primary consumers is 10% of 10,000 J = $\frac{10}{100} \times 10,000 \text{ J} = 1,000 \text{ J}$.

For primary consumers, the available energy is 1,000 J.

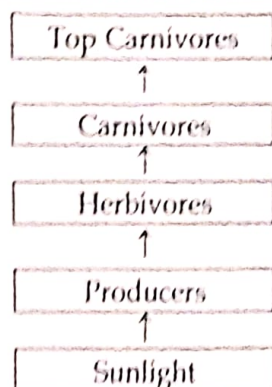
The energy transferred from primary consumers to secondary consumers is 10% of 1,000 J = $\frac{10}{100} \times 1,000 \text{ J} = 100 \text{ J}$.

For secondary consumers, the available energy is 100 J.

The energy transferred from secondary consumers to tertiary consumers is 10% of 100 J = $\frac{10}{100} \times 100 \text{ J} = 10 \text{ J}$.

Q.6. Define an ecosystem. Draw a block diagram to show the flow of energy in an ecosystem. [CBSE 2019]

Ans. All the interacting organisms in an area together with the non-living constituents of the environment form an ecosystem.

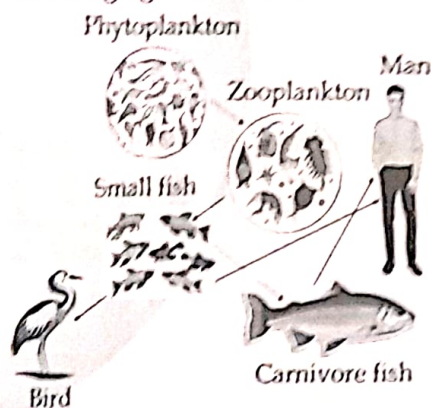


Q.7. Mention the differences between food habits of organisms belonging to the first and third trophic level. Give one example of each of them. **Compare**

Ans. Difference Table:

	First Trophic Level	Third Trophic Level
(i)	This trophic level mainly consists of producers that synthesize their own food.	This level mainly consists of animals, which are secondary consumers.
(ii)	They have the capacity to convert solar energy into chemical energy.	They can't synthesize their own food, so they obtain energy from other animals.
(iii)	Example: Plants	Example: Lion

Q.8. A food web consists of many interrelated food chains. It represents the feeding relationship between many food chains. An aquatic food web is represented in the image given below.



Consider that a dam is constructed across the river where this aquatic food web exists. The small fishes in the river generally travel upstream to lay eggs which was not possible after the construction of the dam.

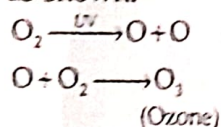
The population of which organism is MOST likely to increase due to the construction of the dam? Justify.

Ans. • The population of zooplankton may increase.
• If small fish cannot lay eggs, their rate of reproduction will decline over time, leading to lower consumption of zooplankton.

State one important function of ozone layer in the atmosphere. How is it formed there? Which compounds are responsible for the depletion of ozone layer? How do these compounds enter into the atmosphere? [CBSE 2024]

The ozone layer shields the surface of the Earth from ultraviolet (UV) radiation from the Sun. This radiation is highly damaging to organisms; for example, it is known to cause skin cancer in human beings.

Ozone at the higher levels of the atmosphere is a product of UV radiation acting on oxygen (O_2) molecules. The higher-energy UV radiations split apart some molecular oxygen (O_2) into free oxygen (O) atoms. These atoms then combine with the molecular oxygen to form ozone, as shown:



Chlorofluorocarbons are responsible for the depletion of the ozone layer, and these compounds enter the atmosphere through refrigerators and air conditioners.

11. Distinguish between biodegradable and non-biodegradable substances by given one example of each from our daily life. List two effects of each of them on our environment. **COMPETENCY**

Ans.

	Biodegradable Waste	Non-Biodegradable Waste
(i)	Biodegradable waste is easily broken down by decomposers.	Non-biodegradable waste does not break down through decomposers.
(ii)	They can be converted into manure.	These wastes cannot be converted into manure but can be recycled or reused.

	Example: Vegetables, fruit peels, etc.	Example: Plastic, polythene, DDT, etc.
(iii)	Effects: (i) When decomposed, they produce harmful gases. (ii) They generally do not pollute the environment.	Effects: (i) They do not decompose and remain in the environment for a very long period. (ii) They are the main cause of pollution in the environment and also release harmful gases.

Q.11. Why should biodegradable and non-biodegradable wastes be discarded in two separate dustbins? [CBSE 2013, 15]

Ans. Biodegradable and non-biodegradable wastes should be discarded in two separate dustbins because biodegradable waste is decomposed by microorganisms to form simple, harmless substances that can be used as manure for plants (e.g., in potted plants in our garden or terrace garden). Non-biodegradable waste cannot be broken down naturally.

Q.12. What are the problems caused by the non-biodegradable wastes that we generate? **COMPETENCY**

Ans. The non-biodegradable waste remains in the environment for a very long period of time and during that time, they cause various problems like:

- If they are burned, they produce various toxic gases like carbon dioxide, carbon monoxide and sulphur dioxide, etc.
- If dumped in water bodies, they will pollute the water and harm aquatic life.
- If dumped on land, they will contaminate the land and reduce its fertility.

— Long Answer Questions —

Q.1. Define the following: [CBSE 2014]

- (a) Food chain (b) Trophic level
- (c) Producers (d) Parasites
- (e) Non-biodegradable substances

Ans. (a) Food Chain.

A series of organisms feeding on one another, with successive organisms. These series of organisms take part at various biotic levels in a food chain.

(b) Trophic Level.

Each step or level of the food chain forms a trophic level.

(c) Producers.

All green plants and certain bacteria that can produce food by photosynthesis come under this category and are called producers.

(d) Parasites.

An animal or plant that lives in or on other organisms to obtain nutrition.

(e) Non-Biodegradable Substances.

Non-biodegradable substances do not decompose by decomposers.

Q.2. Will the impact of removing all the organisms in a trophic level be different for different trophic levels? Can the organisms of any trophic level be removed without causing any damage to the ecosystem? **COMPETENCY**

Ans. Yes, it will impact the removal of all the organisms in a trophic level and it will be different for different trophic levels. If herbivores are removed, then the producers (plants) will grow out of control and carnivores will not get food. Similarly, if decomposers are removed, all dead organisms will not decompose and will pile up. This will stop the recycling of nutrients in the soil.

Q.3. (a) What is the full form of:

(i) UNEP

(ii) CFCs.

(b) On what basis are organisms grouped as producers, decomposers and consumers.

(c) Write two problems that would arise if there were no decomposers in an ecosystem. [CBSE 2011, 12, 13]

Ans. (a) Full form:

(i) UNEP. United Nations Environment Programme.

(ii) CFCs. Chlorofluorocarbons

(b) They are grouped based on the mode of nutrition.

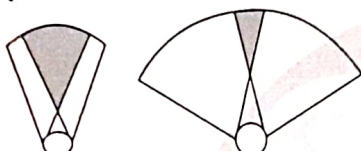
(c) (i) Decomposition of dead organisms will stop and they will pile up.

(ii) The nutrients do not recycle into the soil.

CASE BASED QUESTIONS

1. Shown here is the extent to which two different animals can see in either direction without turning their heads. In animal 1, the eyes are placed towards the front of the head and in animal 2 the eyes are placed on either side of the head.

Since the placement of eyes in the two animals is different, their vision is also slightly different.



Animal 1

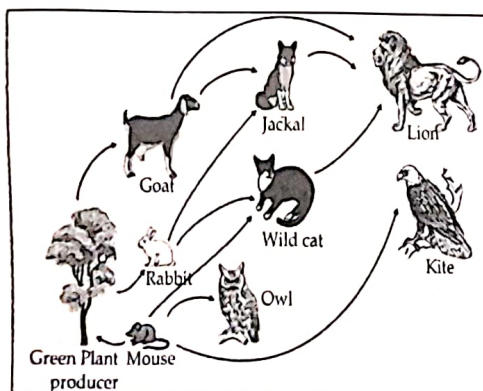
Animal 2

In the figures, the grey part represents the parts that can be seen by both eyes at a time, whereas the white parts represent those parts that can be seen only by one eye at a time.

Animal 2 can see a broader area at any time compared to animal 1. Animal 1 can distinguish depths better compared to animal 2.

(a) Based on this, which of the two animals is most likely to be a predator and why? **COMPETENCY**

(b) Observe the following food web. Classify the animals into two groups—one that would need to have vision as Animal 1 and another as Animal 2 in the Diagram.



(c) bone, metal can, paper sheet, plastic bottle.

Arrange the four objects given above according to the time they take to get biodegraded (LEAST time TO MOST time) **COMPETENCY**

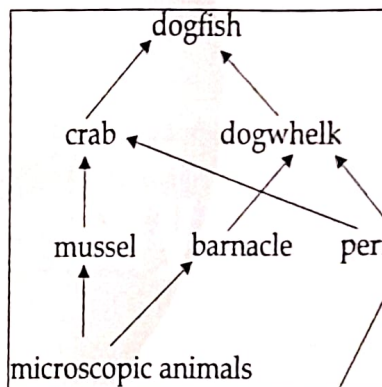
Ans. (a) Animal 1 because it will be able to judge the distance and the movement of the prey accurately.

(b) Animal 1: rabbit, lion, jackal, kite and owl.

Animal 2: mouse, goat

(c) paper sheet, plastic bottle, metal can, bone

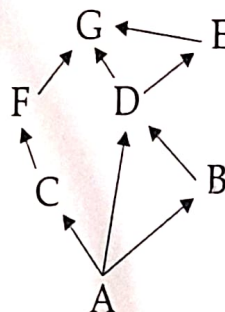
Q.2. Read the following and answer the questions. Observe the food web and answer the questions given below.



(a) Why do all food chains start with plants?

(b) In the food web, which two organisms are competing for food.

COMPETENCY

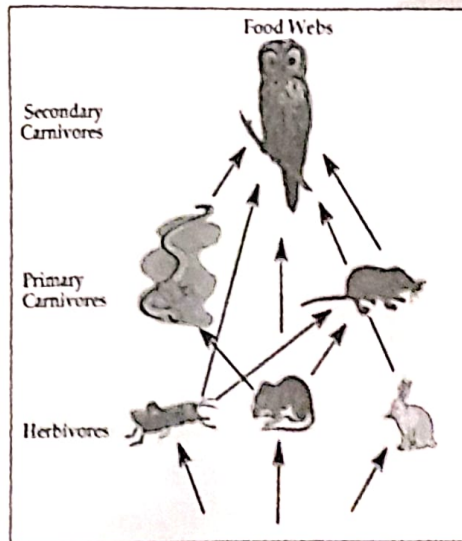


(c) The mussel can be described as?

- Ans. (a) Because plants can produce its own energy.
(b) B and D
(c) The mussel can be described as secondary consumer.

Q.3. Read the following and answer the questions:

Food chains are very important for the survival of most species. Flow of energy is a key mechanism behind the survival of all the organisms in a food chain/web.



(a) If 10,000 J solar energy falls on green plants in a terrestrial ecosystem, what percentage of solar energy will be converted into food energy?

(b) If Ravi is consuming curd/yogurt for lunch, which trophic level in a food chain he should be considered as occupying?

COMPETENCY

(c) Matter and energy are two fundamental inputs of an ecosystem. Describe their movement in nature.

Ans. (a) 100 J

(b) Third trophic level

(c) Energy flows unidirectionally, while matter cycles repeatedly.

(DAY 27 SWAHA)

12

Carbon and its Compounds



What did CBSE ask last year?

MCQs & A/Rs	2 Questions ($2 \times 1 = 2$ Marks)
Subjective	—
	No Short Questions asked
	1 Long Question ($1 \times 5 = 5$ Marks)
Case Based	1 Question ($1 + 1 + 2 = 4$ Marks)

Note: All the above typology of questions include 'Competency based Questions' labelled as

COMPETENCY

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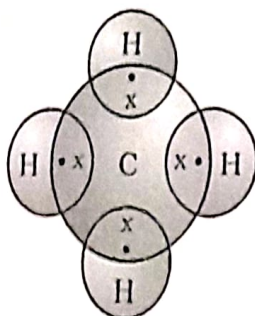
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App Store and
web users



The Covalent Bond

- ❑ Electronic Configuration
- ❑ Properties of Covalent Bond
- ❑ Allotropes of Carbon

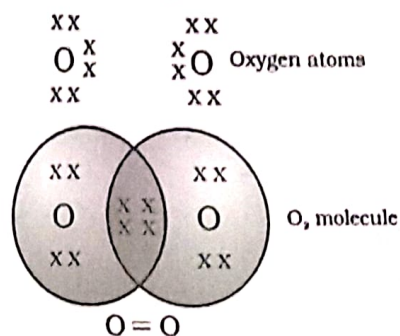
(Electron dot structure is of prime importance)



Versatile Nature of Carbon

- ❑ Exclusive Properties of Carbon
- ❑ Saturated & Unsaturated Carbon Compounds
- ❑ Chains, Branches and Rings
- ❑ Functional Group of Homologous Series
- ❑ Nomenclature of Carbon Compounds

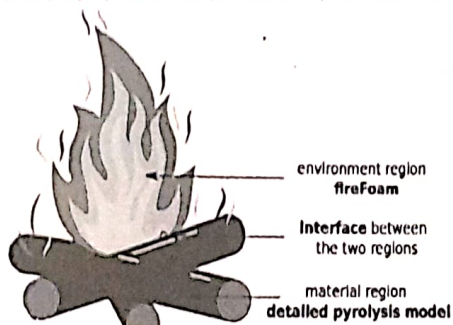
(Nomenclature is the most important topic as questions revolve around drawing structures, isomers and their naming)



Chemical Properties of Carbon Compounds

- ❑ Combustion
- ❑ Addition Reaction
- ❑ Substitution Reaction

(CBSE loves to ask products of these reactions)

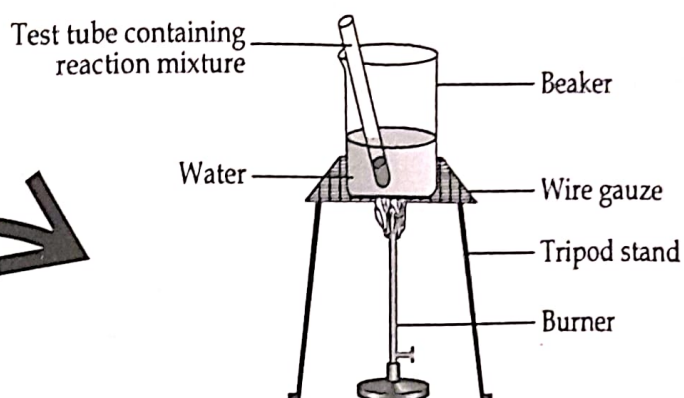


**CARBON A
ITS COMP C**

Ethanol and Ethanoic acid

- Properties of Ethanol
- Properties of Ethanoic and their reactions.

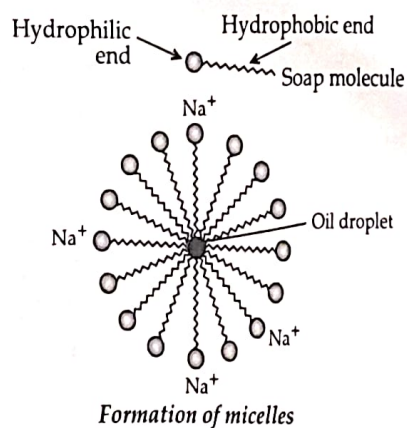
(Physical properties and chemical reactions of both the compounds is asked frequently)



Soaps and Detergents

- Micelles Formation
- Difference between the properties of soaps and detergents

(Short and long questions revolve around difference between the two)



OBJECTIVE QUESTIONS

(DAY 28)

Multiple Choice Questions

Q.1. Which of the following statements are usually correct for carbon compounds?

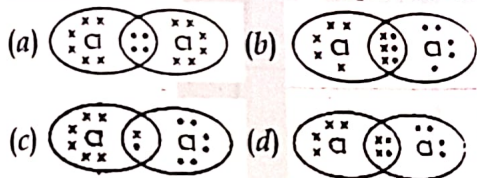
These

- (i) are good conductors of electricity.
- (ii) are poor conductors of electricity.
- (iii) have strong forces of attraction between their molecules.
- (iv) do not have strong forces of attraction between their molecules.

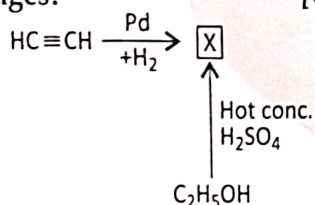
COMPETENCY

- (a) (i) and (iii) (b) (ii) and (iii)
- (c) (i) and (iv) (d) (ii) and (iv)

Q.2. The electron dot structure of chlorine molecule is: [CBSE 2023]



Q.3. Which of the following correctly represents 'X' in the given chemical changes? [CBSE 2024]



- (a) Ethane (b) Ethene
- (c) Ethyne (d) Ethanoic acid

Q.4. Carbon compounds undergo combustion in oxygen to give carbon dioxide along with heat and light.

The same number of molecules of each of the following carbon compounds undergo complete combustion.

- P. CH_3COOH
- Q. $\text{CH}_3\text{CH}_2\text{COOH}$
- R. $\text{CH}_3\text{CH}=\text{CH}_2$
- S. $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$

Which of them will produce the same amount of carbon dioxide?

- (a) Only P and Q
- (b) Only Q and S
- (c) Only P, Q and R
- (d) Only Q, R and S

Q.5. Buckminsterfullerene is an allotropic form of **COMPETENCY**

- (a) phosphorus (b) sulphur
- (c) carbon (d) tin

Q.6. Unsaturated hydrocarbons which contain one or more double bonds are

- (a) Alkynes (b) Alkenes
- (c) Alkanes (d) None of these

Q.7. Identify the unsaturated compounds from the following

- (i) Propane (ii) Propene
- (iii) Propyne (iv) Chloropropane

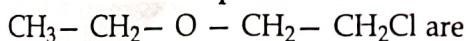
COMPETENCY

- (a) (i) and (ii) (b) (ii) and (iv)
- (c) (iii) and (iv) (d) (ii) and (iii)

Q.8. How many structural isomers can you draw for pentane?

- (a) 1 (b) 2 (c) 3 (d) 4

Q.9. The heteroatoms present in



- (i) oxygen (ii) carbon
- (iii) hydrogen (iv) chlorine
- (a) (i) and (ii) (b) (ii) and (iii)
- (c) (iii) and (iv) (d) (i) and (iv)

Q.10. Pentane has the molecular formula



[NCERT Exemplar]

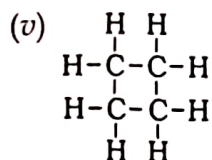
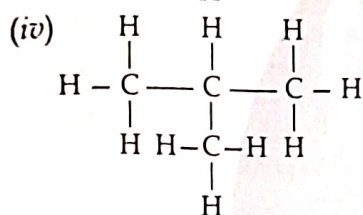
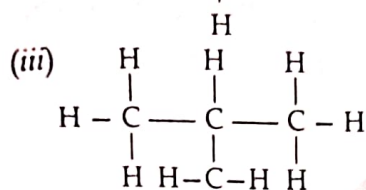
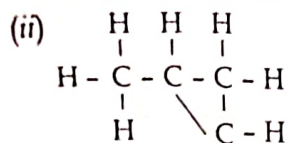
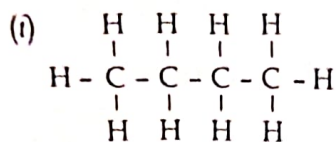
- (a) 5 covalent bonds
- (b) 12 covalent bonds
- (c) 16 covalent bonds
- (d) 17 covalent bonds

Q.11. Name the scientist who disproved the theory of 'vital force'? **COMPETENCY**

- (a) Buckminster Fuller
- (b) Homi J. Bhabha
- (c) Isaac Newton
- (d) Friedrich Wohler

Q.12. Which of the following are correct structural isomers of butane?

[CBSE 2024]



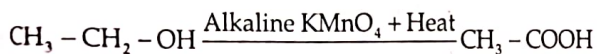
- (a) (i) and (iii) (b) (ii) and (iv)
(c) (i) and (ii) (d) (ii) and (iv)

Q.13. Oils on treating with hydrogen in the presence of palladium or nickel catalyst form fats. This is an example of

- (a) Addition reaction
(b) Substitution reaction
(c) Displacement reaction
(d) Oxidation reaction

Q.14. In the above given reaction, alkaline KMnO_4 acts as

COMPETENCY



- (a) reducing agent
(b) oxidising agent
(c) catalyst
(d) dehydrating agent

Q.15. Chlorine reacts with saturated hydrocarbons at room temperature in the

[NCERT Exemplar]

- (a) absence of sunlight
(b) presence of sunlight
(c) presence of water
(d) presence of hydrochloric acid

Q.16. Vinegar is a solution of

- (a) 50% – 60% acetic acid in alcohol
(b) 5% – 8% acetic acid in alcohol
(c) 5% – 8% acetic acid in water
(d) 50% – 60% acetic acid in water

Q.17. Ethanol reacts with sodium and forms two products. These are [NCERT Exemplar]

- (a) sodium ethanoate and hydrogen
(b) sodium ethanoate and oxygen
(c) sodium ethoxide and hydrogen
(d) sodium ethoxide and oxygen

Q.18. Mineral acids are stronger acids than carboxylic acids because

COMPETENCY

- (i) mineral acids are completely ionised
(ii) carboxylic acids are completely ionised
(iii) mineral acids are partially ionised
(iv) carboxylic acids are partially ionised
(a) (i) and (iv) (b) (ii) and (iii)
(c) (i) and (ii) (d) (iii) and (iv)

Q.19. Reaction between ethanoic acid and ethanol give rise to

COMPETENCY

- (a) Alkenes (b) Halo alkane
(c) Ketone (d) Ester

Q.20. In the soap micelles

- (a) the ionic end of soap is on the surface of the cluster while the carbon chain is in the interior of the cluster.
(b) ionic end of soap is in the interior of the cluster and the carbon chain is out of the cluster.
(c) both ionic end and carbon chain are in the interior of the cluster.
(d) both ionic end and carbon chain are on the exterior of the cluster.

Q.21. Detergent are generally sodium salts of:

COMPETENCY

- (a) Sulphonic acid with chloride or bromides
(b) Ammonium salts with chlorides or bromides
(c) Both a and b
(d) None of these

— Assertion Reason Questions —

Following questions consist of two statements: Assertion (A) and Reason (R).

Answer these questions selecting the appropriate option given below:

- (a) Both A and R are true, and R is the correct explanation of A.
- (b) Both A and R are true, and R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

Q.1. Assertion: The bond formed between two atoms by sharing of electrons is called covalent bond.

Reason: The oxygen atom has a double covalent bond.

COMPETENCY

Q.2. Assertion: Numerous organic compounds are formed containing carbon in the nature.

Reason: Carbon atom has the maximum tendency of catenation.

COMPETENCY

Q.3. Assertion: Alkanes are saturated hydrocarbons.

Reason: Propene is a saturated hydrocarbon.

Q.4. Assertion: Alcohols contain OH functional group.

Reason: Functional group determines the properties of an organic compound.

Q.5. Assertion: Animal fats generally contain saturated fatty acids which are said to be healthy.

Reason: Oils containing unsaturated fatty acids should be chosen for cooking.

Q.6. Assertion: Saturated hydrocarbons will generally give a clean flame.

Reason: Unsaturated carbon compounds will give a yellow flame with lots of black smoke.

Q.7. Assertion: Some countries now use alcohol as an additive in petrol.

Reason: It is a cleaner fuel which gives rise to only carbon dioxide and water on burning in sufficient air (oxygen).

COMPETENCY

Q.8. Assertion: Ethanoic acid reacts with carbonates and hydrogen carbonates to give rise to a salt, carbon dioxide and water.

Reason: The salt produced is commonly called sodium hydrogen carbonate.

COMPETENCY

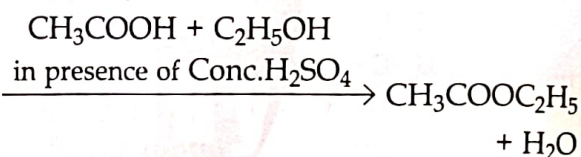
ANSWERS

— Multiple Choice Answers —

- 1. (d) 2. (c) 3. (b) 4. (d)
- 5. (c) 6. (b)
- 7. (d)

FREE ADVICE: The compounds with suffix '-ene' and '-yne' confirms that they are unsaturated compounds whereas '-ane' confirms that it's saturated compound

- 8. (c) 9. (d) 10. (c) 11. (d)
- 12. (a) 13. (a) 14. (b) 15. (b)
- 16. (c) 17. (c) 18. (b)
- 19. (d) **Explanation.**

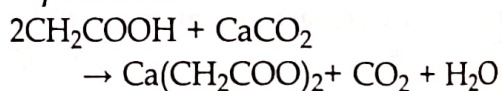


- 20. (a) 21. (c)

— Assertion-Reason Answers —

- 1. (b) Both A and R are true, and R is the correct explanation of A.
- 2. (a) Both A and R are true, and R is the correct explanation of A.
- 3. (c) A is true but R is false.
- 4. (b) Both A and R are true, and R is not the correct explanation of A.
- 5. (d) A is false but R is true.
- 6. (b) Both A and R are true, and R is the correct explanation of A.
- 7. (b) Both A and R are true, and R is not the correct explanation of A.
- 8. (c) A is true but R is false.

Explanation.



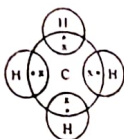
SUBJECTIVE QUESTIONS

Very Short Answer Questions

Q.1. Draw electron dot structure of methane?

COMPETENCY

Ans.



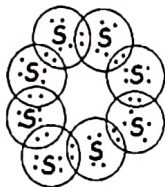
Q.2. Define covalent bonds?

Ans. Bonds which are formed by the sharing of an electron pair between two atoms are known as covalent bonds.

Q.3. What would be the electron dot structure of a molecule of sulphur which is made up of eight atoms of sulphur?

COMPETENCY

Ans.



Q.4. Which elements exhibits the property of catenation to maximum extent and why?

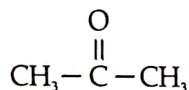
[CBSE 2016]

Ans. Carbon is the element that exhibits the property of catenation to maximum extent, due to its tendency to form strong covalent C-C bonds.

Q.5. Draw the structure of simplest ketone.

[CBSE 2011, 13]

Ans.



Q.6. State the valency of each carbon atom in

(a) an alkane and

(b) an alkyne.

[CBSE 2014]

Ans. (a) The valency of a carbon atom in an alkane is four.

(b) The valency of a carbon atom in an alkyne is four.

Q.7. How would you name the following compounds?

(a) $\text{CH}_3 - \text{CH}_2 - \text{CH} = \text{CH}_2$

(b) $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{C}(\text{CH}_3)_2 - \text{CH}_3$

(c) $\text{CH}_3 - \text{CH}_2 - \text{CHO}$

(d) $\text{CH}_3 - \text{CH}(\text{OH}) - \text{CH}_3$ [CBSE 2014]

Ans. (a) But-1-ene

(b) 2,2-dimethylpentane

(c) Propanal

(d) Propan-2-ol

Q.8. Write the name and formula of the 2nd member of homologous series having general formula $\text{C}_n\text{H}_{2n-2}$

COMPETENCY

Ans. Name - Propyne

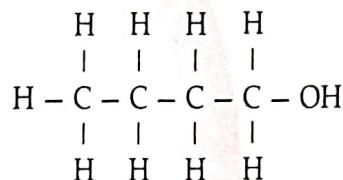
$\text{C}_n\text{H}_{2n-2}$ - Alkynes

Formula: C_3H_4

Q.9. Write the name and structure of an alcohol with four carbon atoms in its molecule.

[CBSE 2026]

Ans. Name of an alcohol: Butanol



Structure of butanol

Q.10. Convert CH_2 into CCl_2 by substituting hydrogen atom with chlorine atom in successive reactions. Why this reaction is referred to as a substitution reaction?

COMPETENCY

Ans. $\text{CH}_4 + \text{Cl}_2 + \text{Sunlight} \rightarrow \text{CH}_3\text{Cl} + \text{HCl}$

$\text{CH}_3\text{Cl} + \text{Cl}_2 \rightarrow \text{CH}_2\text{Cl}_2 + \text{HCl}$

$\text{CH}_2\text{Cl}_2 + \text{Cl}_2 \rightarrow \text{CHCl}_3 + \text{HCl}$

$\text{CHCl}_3 + \text{Cl}_2 \rightarrow \text{CCl}_4 + \text{HCl}$

This reaction is referred to as a substitution reaction because hydrogen atom is replaced by hetroatom(Cl).

(DAY 29)

Short Answer Questions

Q.1. What are covalent compounds? Why are they different from ionic compounds? List their three characteristic properties.

[CBSE 2016]

Ans. (a) Unlike ionic compounds, where atoms transfer electrons to form ions, covalent compounds involve the equal sharing of electrons between atoms

(b) Covalent compounds are formed by the sharing of electrons between two or more atoms, typically non-metals. These compounds consist of molecules held together by covalent bonds

Characteristics of covalent compounds:

(i) Covalent compounds are often insoluble in water but are soluble in organic solvents. This is because water is a polar solvent, while covalent compounds are typically non-polar or have weak polarity.

(ii) Covalent compounds typically have low melting and boiling points because they are composed of electrically neutral molecules. The intermolecular forces holding these molecules together are relatively weak, so only a small amount of heat energy is required to break these forces.

(iii) Covalent compounds do not conduct electricity in their pure state because they do not contain ions. They lack the free-moving charged particles (ions) necessary for electrical conductivity.

Q.2. (a) Differentiate between alkanes and alkenes. Name and draw the structure of one member of each.

(b) Alkanes generally burn with clean flame. Why?

COMPETENCY

Ans. (a)

	Alkane	Alkenes
(i)	An alkane is a hydrocarbon in which the carbon atoms are connected by only single covalent bond.	An alkene is an unsaturated hydrocarbon in which the two carbon atoms are connected by a double bond.

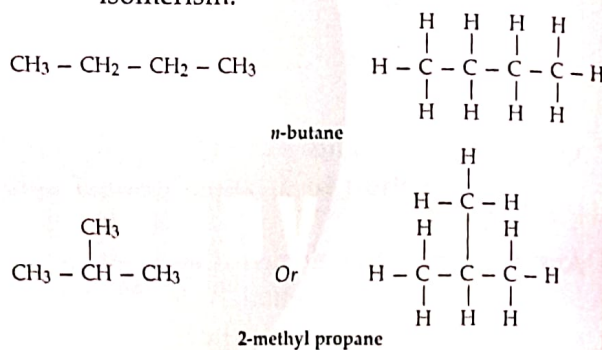
(ii)	Alkanes generally burn in air with a blue and non-sooty flame.	Alkenes burn in air with a yellow and sooty flame.
(iii)	General formula $-C_nH_{2n+2}$	General formula $-C_2H_{2n}$

(b) Alkanes burn in air with a blue and non-sooty flame because the percentage of carbon in the alkane is relatively low, and it undergoes complete oxidation by the oxygen present in the air.

Q.3. What are isomers and what is isomerism? Draw the structures of two isomers of butane, C_4H_{10} . Why can we not have isomers of first three members of alkane series?

COMPETENCY

Ans. The organic compounds with the same molecular formula but different structures are referred to as isomers, and this phenomenon is known as isomerism.



Isomerism cannot occur in the first three members of the alkane series (i.e., methane, ethane, propane) because they contain only one, two, or three carbon atoms, respectively. With only 1, 2, or 3 carbon atoms, it is not possible to have different arrangements of carbon atoms.

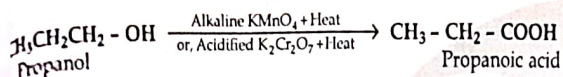
Q.4. What happens when 5% alkaline potassium permanganate solution is added drop by drop to warm propyl alcohol (propanol) taken in a test tube? Explain with the help of a chemical equation.

[CBSE 2019]

Ans. The substance that provides oxygen for the oxidation reaction is known as an oxidising agent.

Examples: Potassium permanganate and potassium dichromate.

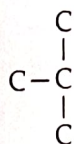
During this reaction, alcohols are transformed into carboxylic acids because carbon compounds are readily oxidised. Therefore, when propanol is heated with an alkaline potassium permanganate solution (or acidified potassium dichromate solution), it undergoes oxidation to form propanoic acid. The colour of potassium permanganate does not disappear because it is used to oxidise alcohols into acids.



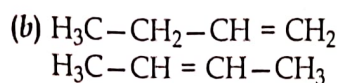
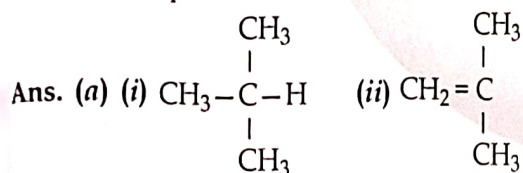
Q.5. Given below is a four carbon skeleton of a hydrocarbon compound.

(a) Fill in the hydrogen atoms/bonds to form:

- (i) a saturated hydrocarbon
- (ii) an unsaturated hydrocarbon



(b) If the four-carbon skeleton is of a straight chained alkene, draw the structures of all the possible compounds.



Q.6. A compound 'X' on heating with excess conc. sulphuric acid at 443 K gives an unsaturated compound 'Y'. 'X' also reacts with sodium metal to evolve a colourless gas 'Z'. Identify 'X', 'Y' and 'Z'. Write the equation of the chemical reaction of formation of 'Y' and also write the role of sulphuric acid in the reaction.

COMPETENCY

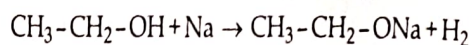
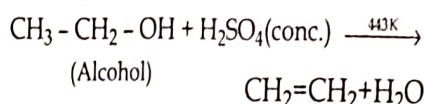
Ans. Compound 'X,' when heated with an excess of concentrated sulfuric acid at

443 K, yields an unsaturated compound.

X - $\text{C}_2\text{H}_5\text{OH}$

Y - C_2H_4

Z - H_2



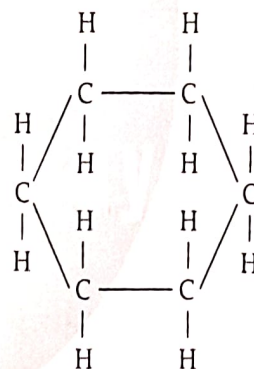
Q.7. A carbon compound P has six carbon atoms and twelve hydrogen atoms.

- (a) Is P a saturated or unsaturated carbon compound. Justify your answer by drawing the structural formula.
- (b) Describe a test that can be used to determine if compound P is saturated or unsaturated.
- (c) Name the products that are formed on burning compound P in an excess of air.

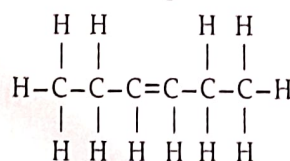
COMPETENCY

Ans. (a) Compound P may be either saturated or unsaturated.

saturated compound: cyclohexane



unsaturated compound: 3-hexene

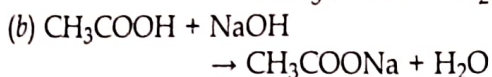
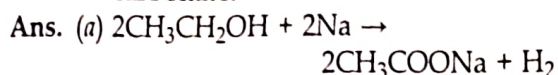


- (b) Burning the compound in an excess of air will produce a sooty flame if it is unsaturated and a clean flame if it is saturated.
- (c) Carbon dioxide and water.

Q.8. Write balanced chemical equation for the following [CBSE 2012, 13]

- (a) Ethanol is treated with sodium.
- (b) Ethanoic acid is formed reacted with sodium hydroxide.

(c) Ethanoic acid is treated with sodium carbonate.



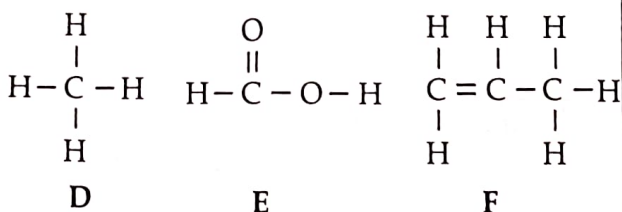
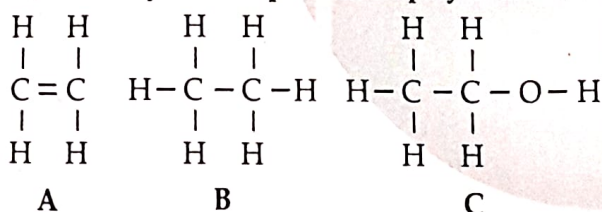
Q.9. What is the difference between the chemical composition of soaps and detergents?

COMPETENCY

Ans.

	Soaps	Detergent
(i)	Soaps do not produce foam with hard water.	Detergents create foam even in hard water.
(ii)	Soaps are mild cleansing agents.	Detergents are strong cleansing agents.
(iii)	Soaps are sodium or potassium salts of certain long-chain carboxylic acids.	Detergents are typically ammonium or sulphonate salts of long-chain carboxylic acids.
(iv)	Soaps are environmentally friendly substances.	Detergents are not Biodegradable substances.

Q.10. Study the compounds displayed below:



(a) Identify all the compounds that are the first members of their respective homologous series.

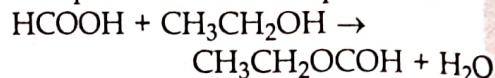
(b) Which of the above compounds are likely to undergo non-catalytic hydrogenation reaction?

(c) Which two compounds will combine to form an ester? Justify with an equation for the reaction.

Ans. (a) A, D, E

(b) Compound A and compound F

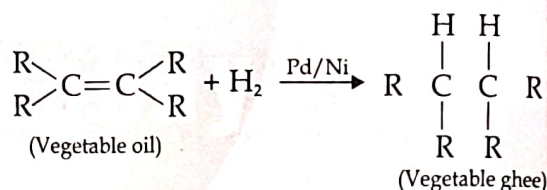
(c) Compound E and Compound C



Q.11. Why should we prefer vegetable oils over animal fats for cooking food? Give a balanced chemical equation for the reaction for hydrogenation of vegetable oils. Name the catalysts in this reaction. [CBSE 2015, T-III]

Ans. (a) Vegetable oils consist of unsaturated fatty acids, while vegetable ghee consists of saturated fatty acids, which are considered to be harmful for health.

(b) Vegetable oils are transformed into vegetable ghee by introducing hydrogen in the presence of catalysts like nickel (Ni) or palladium (Pd).



(c) This process is referred to as addition reaction (hydrogenation), which is defined as the addition of hydrogen atoms to the carbon atoms of an organic compound.

(DAY 30)

Long Answer Questions

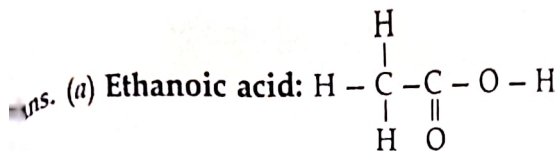
Q.1. Draw the structures for the following compounds.

(a) Ethanoic acid (b) Bromopentane

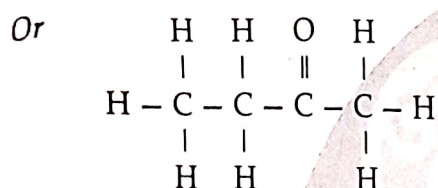
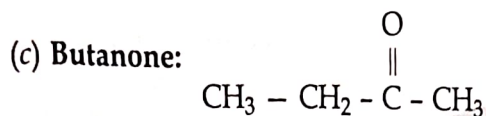
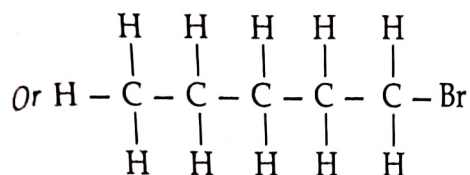
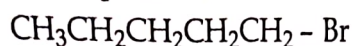
(c) Butanone (d) Hexanal.

Are structural isomers possible for bromopentane?

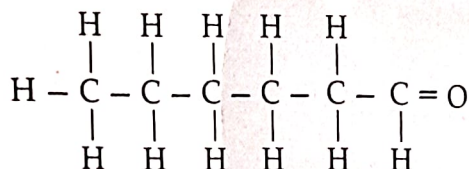
COMPETENCY



(b) **Bromopentane:**



(d) **Hexanal:**



Yes, there are structural isomers possible for bromopentane and they are of two types

(a) Position isomers, (b) Chain isomers

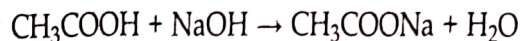
Q.2. (a) A compound 'A' with a molecular formula of $\text{C}_2\text{H}_4\text{O}_2$ reacts with a base to give salt and water. Identify 'A', state its nature and the name of the functional group it possesses. Write chemical equation for the reaction involved.

(b) When the above stated compound 'A' reacts with another compound 'B' having molecular formula CHO in the presence of an acid, a sweet smelling compound 'C' is formed.

1. Identify 'B' and 'C'.
2. State the role of acid in this reaction.
3. Write chemical equation for the reaction involved. **COMPETENCY**

Ans. (a) Name. A is ethanoic acid (CH_3COOH) Nature. A is acidic in nature.

Functional Group. The functional group possessed by A is carboxylic acid.

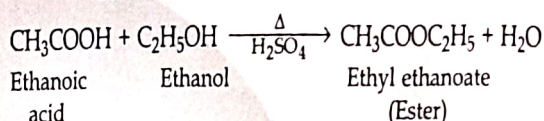


1. Compound B - $\text{C}_2\text{H}_6\text{O}$

Compound C - $\text{C}_2\text{H}_5\text{OH}$

2. The concentrated acid in the above reaction acts as dehydrating agent which removes water molecule from acid and alcohol.

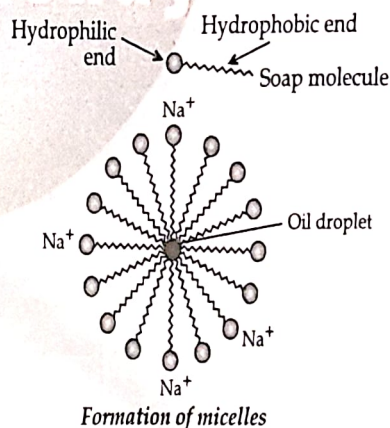
3.



Q.3. (a) What are soaps? Explain the mechanism of cleansing action of soap with the help of a labelled diagram.

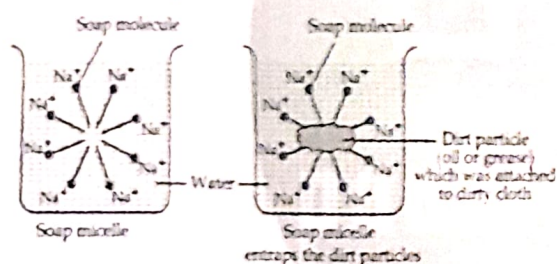
(b) Detergents are better than soaps. Justify. **[CBSE 2023]**

Ans. (a) A soap is the sodium salt (or potassium salt) of a long-chain carboxylic acid (fatty acid) with cleansing properties in water.



Action of soap in removing an oily spot from a piece of cloth: Soaps are molecules with two distinct ends. One end is hydrophilic, meaning it dissolves in water, while the other end is hydrophobic, meaning it dissolves in hydrocarbons. When soap is on the surface of water, the

hydrophobic 'tail' of soap is not soluble in water. The soap aligns along the water's surface with the ionic end in water and the hydrocarbon 'tail' extending out of the water. In water, these molecules adopt a specific orientation that keeps the hydrocarbon portion out of the water. This is accomplished by forming clusters of molecules where the hydrophobic tails are inside the cluster, and the ionic ends are on the cluster's surface. This structure is known as a micelle. Soap in the form of a micelle is effective at cleaning because the oily dirt is collected in the center of the micelle. These micelles remain in solution as a colloid and do not coalesce due to ion-ion repulsion. As a result, the dirt suspended in the micelles is easily rinsed away.



(b) Detergents are better than soaps because of the following reasons:

1. Detergents can be used even with hard water whereas soaps are not suitable for use with hard water.
2. Detergents have a stronger cleansing action than soaps.
3. Detergents are more soluble in water than soaps.

Q.4. An organic compound 'P' is a constituent of wines. 'P' on reacting with acidified $K_2Cr_2O_7$ forms another compound 'Q'. When a piece of sodium is added to 'Q', a gas 'R' evolves which burns with a pop sound when a burning matchstick is brought near it.

(a) Give the chemical name of compound P.

(b) Mention another use of the compound 'P' apart from the use mentioned in the question.

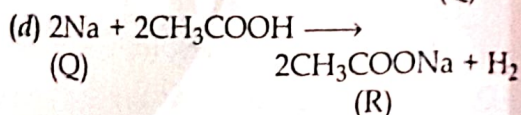
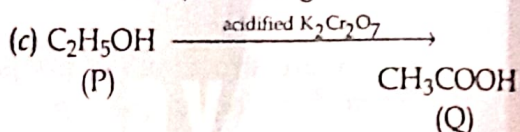
(c) Illustrate with the help of chemical equation the conversion of 'P' into 'Q'.

(d) Give a balanced equation to depict the reaction of Q with sodium.

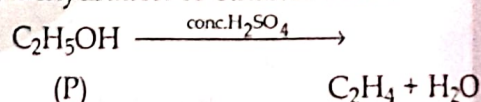
(e) What happens when 'P' is heated with conc. H_2SO_4 at 443 K, write its chemical equation. [CBSE 2024]

Ans. (a) P = Ethanol

(b) Industrial solvent/ ingredient of cough syrup/ homeopathic medicines / lab reagent.



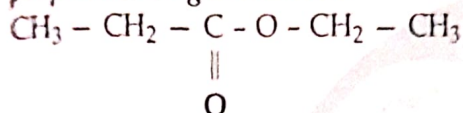
(e) Dehydration of ethanol occurs



CASE BASED QUESTIONS

Q1. Kids love to eat fruits that taste good, but fruits are full of vitamins and minerals required by our human body. The interesting thing is that a carbon compound is present in certain fruits. Ethyl propanoate is a colourless compound with a pineapple-like smell. It is present naturally in some fruits such as kiwis and strawberries.

The structural formula of ethyl propanoate is given below.



- Write the names of the carboxylic acid and the alcohol from which this compound is formed.
- What is functional group?
- Apart from mixing the carboxylic acid and the alcohol, what should be done to form this compound?

COMPETENCY

- Ans. (a) acid-propanoic acid/propionic acid alcohol-ethanol/ethyl alcohol.
- The heteroatoms and the group containing these confer specific properties to the compound, regardless of the length and nature of the carbon chain and hence are called functional groups.
 - Add an acid catalyst and heat the reaction mixture.

Q2. Home-made vinegar is produced from wine. The wine is taken in a clean glass jar and shaken well to aerate it. Some water is added to the jar and then it is kept undisturbed in a dark place at room temperature to undergo fermentation. After 3-4 weeks, the vinegar would be ready to use.

- Name the functional groups of the main organic compounds present in wine and vinegar.

COMPETENCY

- Based on the atoms getting added/removed when wine is converted to

vinegar, name the type of reaction that happens.

COMPETENCY

- Name any chemical reagent that would be used for the same reaction if it is carried out in the laboratory.

Ans. (a) wine - hydroxyl/alcohol/-OH vinegar - carboxyl/carboxylic acid/-COOH

- the wine is converted to vinegar by the oxidation reaction and Acetobacter bacteria convert wine into vinegar in presence of oxygen

- potassium permanganate/potassium dichromate

Q3. Study the following information given and answer the questions that follow.

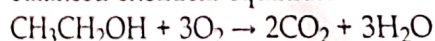
Ethanol is a renewable biofuel because it is made from biomass. Ethanol is a clear, colourless alcohol made from a variety of biomass materials. Ethanol producers mostly use food grains and crops with high starch and sugar content such as corn, sorghum, barley, sugar cane, and sugar beets. The most common ethanol production processes today use yeast to ferment the starch and sugars in corn, sugar cane, and sugar beets.

- What is the chemical formula for ethanol?
- What other compound is obtained as a by-product when ethanol is obtained from sugar? [CBSE 2024]
- What would be the products formed when ethanol undergoes complete combustion? Support your answer with a balanced chemical equation.

Ans. (a) $\text{CH}_3\text{CH}_2\text{OH}$

- carbon dioxide/ CO_2

- carbon dioxide and water are products formed when ethanol undergoes complete combustion balanced chemical equation-



(DAY 30 SWAHA)



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13 Life Processes



What did CBSE ask last year?

MCQs & A/Rs	2 Questions ($2 \times 1 = 2$ Marks)
Subjective	No Very Short Questions asked
	1 Short Question ($1 \times 3 = 3$ Marks)
	1 Long Question ($1 \times 5 = 5$ Marks)
Case Based	No Case Based Questions asked

Note: All the above typology of questions include 'Competency based Questions' labelled as **COMPETENCY**.

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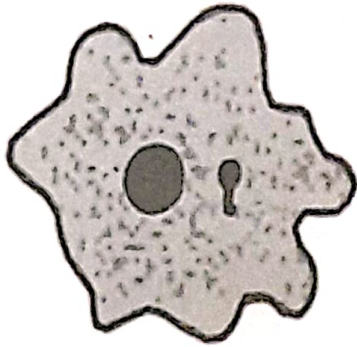


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What are Life Processes?

- Basic Introduction of the Chapter

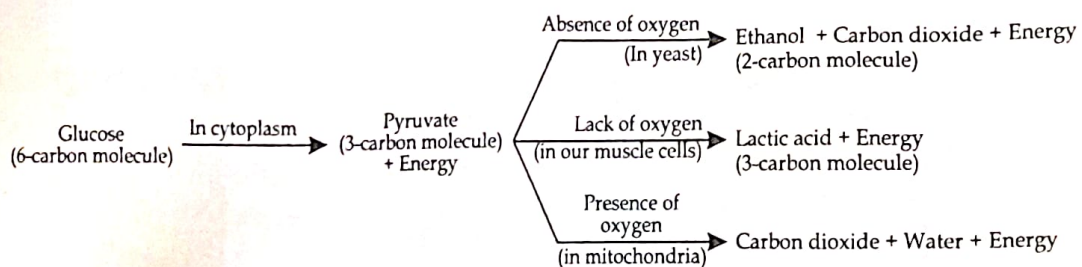


Nutrition

- Autotrophic Nutrition
- Heterotrophic Nutrition
(Difference between the two is asked frequently)
- How do organisms obtain their Nutrition?
- Nutrition in Human beings
(Functions of various organs and it's secretions is of prime importance)

Respiration

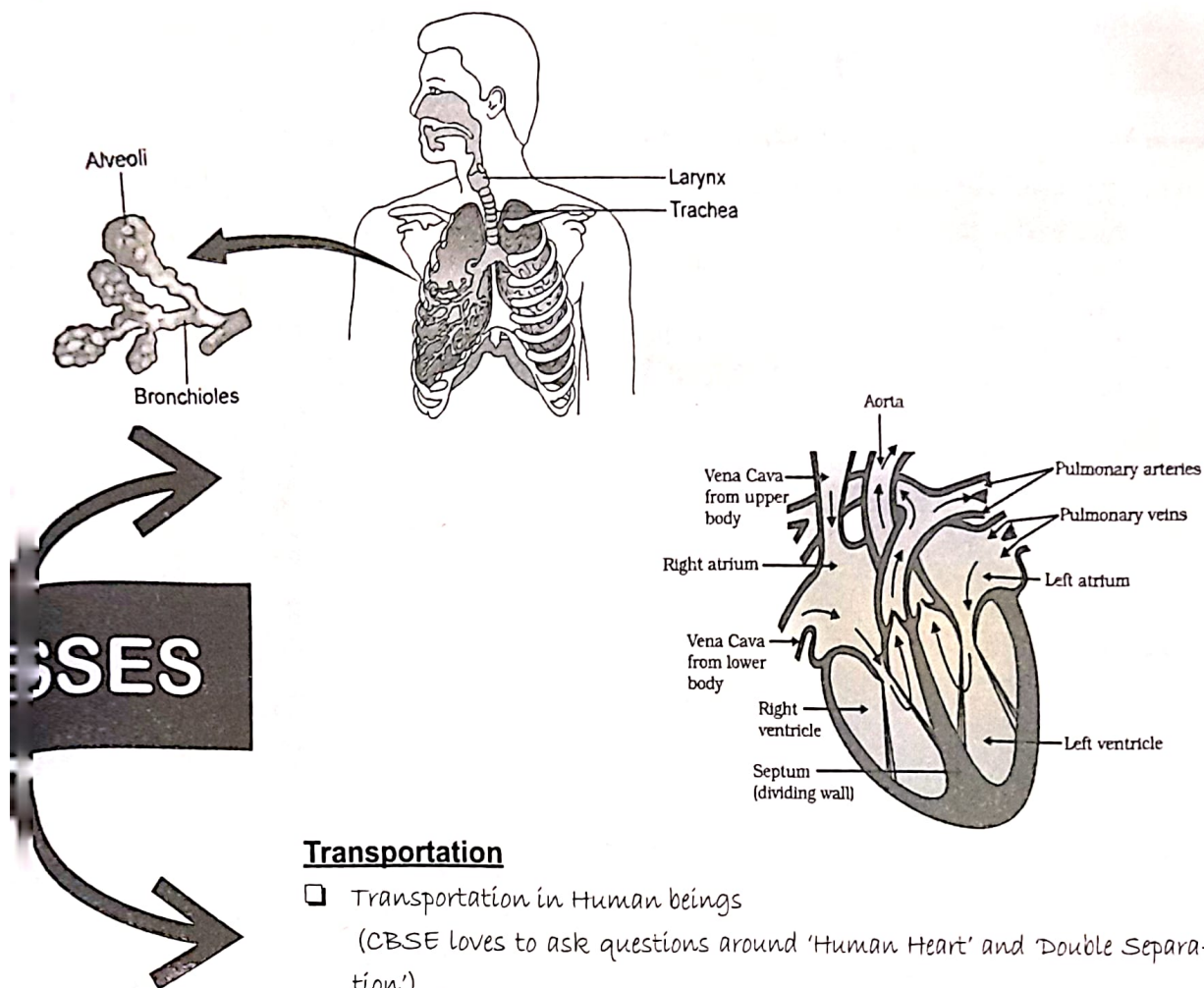
- Types of Respiration



LIFE PROC

Human Respiration

(Exchange of gases through alveoli is of prime importance)

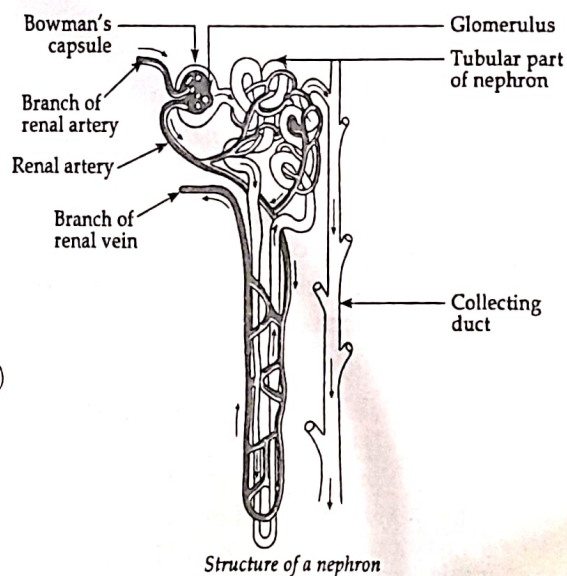


Transportation

- ❑ Transportation in Human beings
(CBSE loves to ask questions around 'Human Heart' and 'Double Separation')
- ❑ Transportation in Plants
(Short answer questions revolve around the transportation of food, minerals and water)

Excretion

- ❑ Excretion in Human Beings
- ❑ Hemodialysis
- ❑ Excretion in Plants
(Structure of nephron is CBSE's favourite topic)



OBJECTIVE QUESTIONS

(DAY 31)

Multiple Choice Questions

Q.1. The liver secretes bile, needed to digest fats in our food. The pancreas secretes several enzymes needed to break down food.

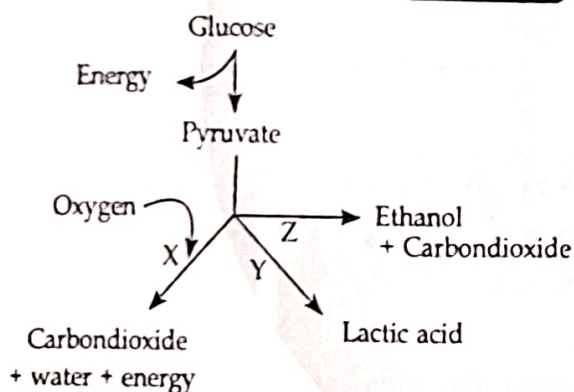
Which of the following is true of the food that we eat?

COMPETENCY

- (a) It passes only through our liver.
- (b) It passes only through our pancreas.
- (c) It passes through both our liver and pancreas.
- (d) It passes neither through our liver nor pancreas.

Q.2. Which of the following occurs during oxygen shortage in muscle cells?

COMPETENCY



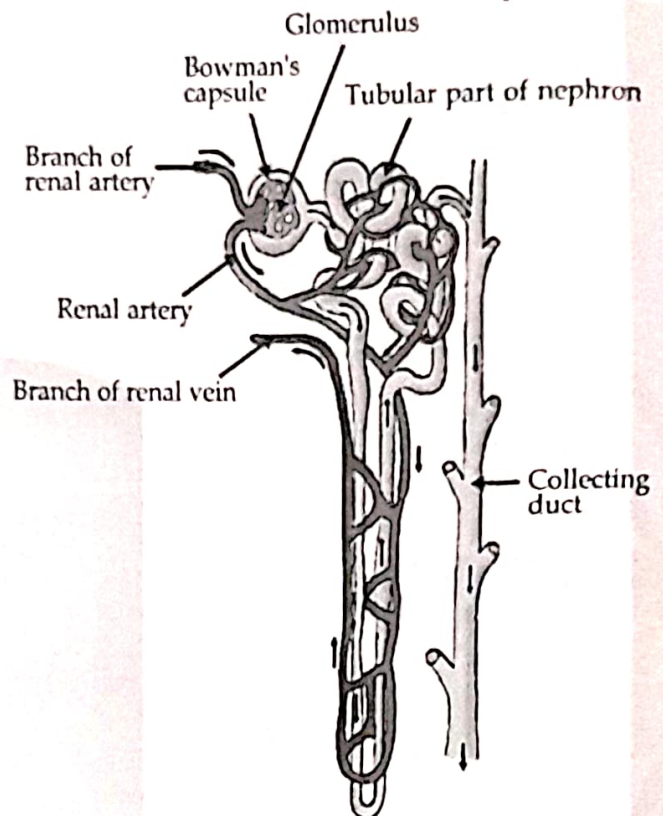
- (a) Only X
- (b) Only Y
- (c) Only Z
- (d) Any of them- X, Y and Z

Q.3. Given below are two columns, Column I shows enzymes secreted by the glands in the alimentary canal of human beings and Column II indicates the components of food on which enzymes act. Choose the options showing correct matching [CBSE 2023]

	Column I (Enzymes)	Column II (Components)
(a)	Pepsin	Starch
(b)	Typsin	Proteins
(c)	Lipase	Proteins
(d)	Amylase	Emulsified fat

Q.4. Observe the image of a single nephron.

[CBSE 2024]



Structure of a nephron

The amount of liquid passing through in the form of glomerular filtrate is approximately 150-180 litres per day whereas the amount of urine flowing out of all the nephrons is only 1.5 to 1.8 litres per day. Water is getting reabsorbed.

In which part of the nephron could the water be getting reabsorbed?

- (a) in the Bowman's cup
- (b) in the long tubular part
- (c) in the collecting duct
- (d) in the glomerulus

Q.5. One of the events that does not occur during photosynthesis is: [CBSE 2023]

- (a) Chlorophyll absorbs solar energy.
- (b) Carbon dioxide is released during the process.
- (c) Oxygen is released during the process.
- (d) Carbon dioxide is absorbed during the process

A few drops of iodine solution were added to rice water. The solution turned blue-black in colour. This indicates that rice water contains

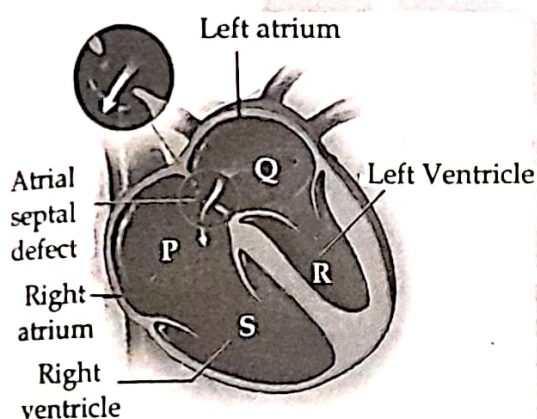
COMPETENCY

- (a) complex proteins
- (b) simple proteins
- (c) fats
- (d) starch

Some adults have a defective heart since birth. They are born with a hole between the left atrium and right atrium (shown below), this defect is called the Atrial Septal Defect (ASD). Due to the hole between the atria, oxygenated blood gets mixed with deoxygenated blood.

A symptom of this disease is to feel tired easily.

COMPETENCY



Heart with Atrial Septal Defect

Which of the following is likely to happen in people with ASD in a single cycle of blood flow?

- (a) The kidneys will filter out more carbon dioxide.
- (b) The blood will take up more oxygen from the lungs.
- (c) The muscles will receive blood containing less oxygen.
- (d) The lungs will receive blood containing more carbon dioxide.

Q.8. Opening and closing of stomata is due to:

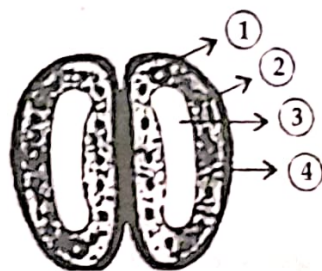
[CBSE 2023]

- (a) High pressure of gases inside the cells.

- (b) Movement of water in and out of the guard cells.
- (c) Stimulus of light in the guard cells.
- (d) None of these

Q.9. In the given diagram of a closed stomata: (1), (2), (3) and (4) respectively

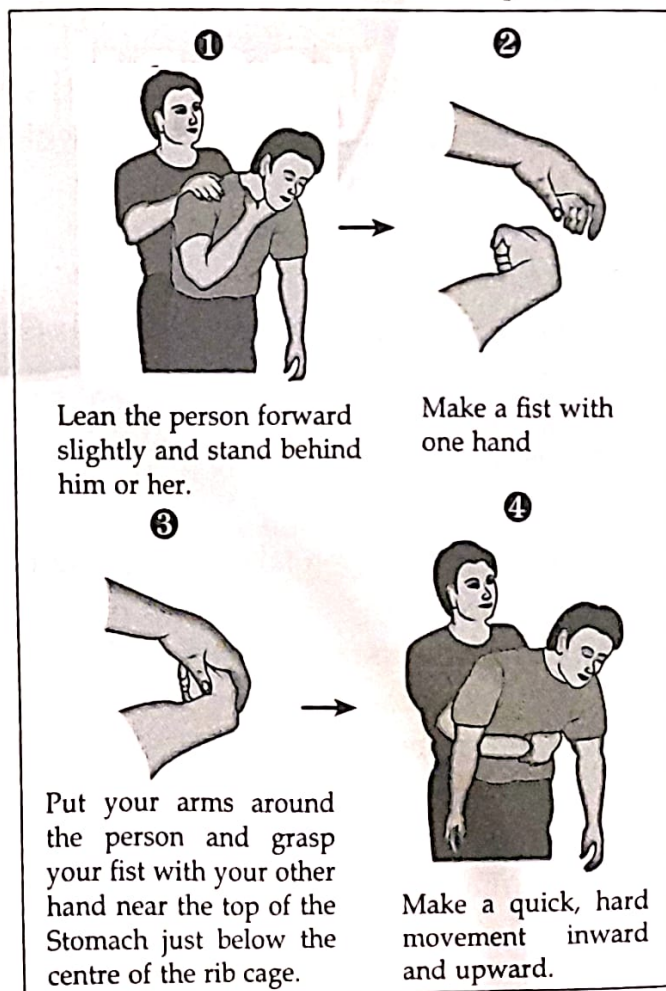
are: **COMPETENCY**



- (a) nucleus, chloroplast, guard cell, vacuole
- (b) nucleus, chloroplast, vacuole, guard cell
- (c) chloroplast, nucleus, vacuole, guard cell
- (d) vacuole, guard cell, nucleus, chloroplast

Q.10. A person can choke when a piece of food becomes lodged in the windpipe, blocking the flow of air. A first aid procedure to remove the blockage is the Heimlich manoeuvre described below:

[CBSE 2024]



By performing this procedure, the piece of food is pushed out of the windpipe. Which of the following causes this to happen?

- (a) the expansion of the chest
- (b) the air pressed out of the lungs
- (c) the food pressed out of the stomach
- (d) the upward movement of the wall of the food pipe

Q.11. Which of the following statement(s) is (are) true about respiration?

- (i) During inhalation, ribs move inward and diaphragm is raised
- (ii) In the alveoli, exchange of gases takes place i.e., oxygen from alveolar air diffuses into blood and carbon dioxide from blood into alveolar air
- (iii) Haemoglobin has greater affinity for carbon dioxide than oxygen
- (iv) Alveoli increase surface area for exchange of gases

COMPETENCY

- (a) (i) and (iv) (b) (ii) and (iii)
- (c) (i) and (iii) (d) (ii) and (iv)

Q.12. During deficiency of oxygen in tissues of human beings, pyruvic acid is converted into lactic acid in the

- (a) cytoplasm (b) chloroplast
- (c) mitochondria (d) golgi body

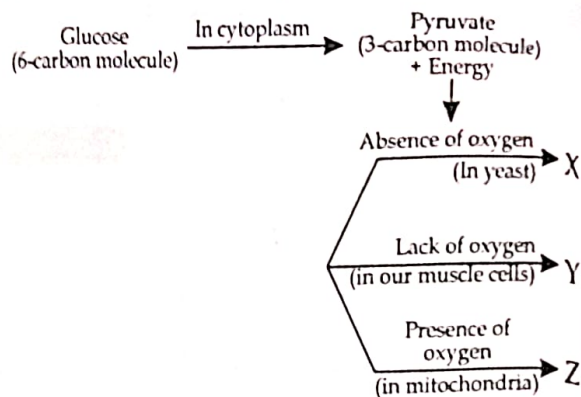
Q.13. Which of the following statement (s) is (are) correct?

- (i) Pyruvate can be converted into ethanol and carbon dioxide by yeast
- (ii) Fermentation takes place in aerobic bacteria
- (iii) Fermentation takes place in mitochondria
- (iv) Fermentation is a form of anaerobic respiration

[NCERT Exemplar]

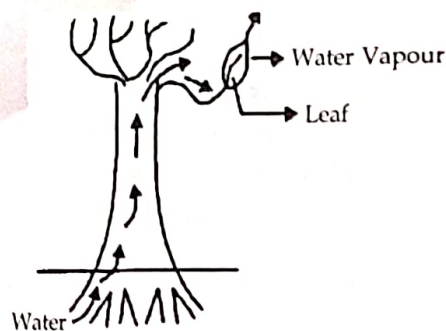
- (a) (i) and (iii) (b) (ii) and (iv)
- (c) (i) and (iv) (d) (ii) and (iii)

Q.14. Find the correct pair



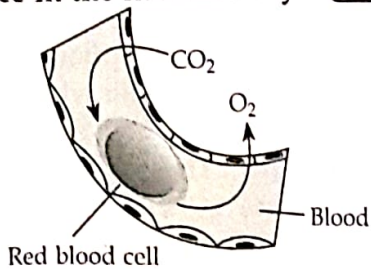
- (a) X-Carbon dioxide + Water + Energy
Y-Ethanol + Carbon dioxide + Energy
Z-Lactic acid + Energy
- (b) X-Ethanol + Carbon dioxide + Energy
Y-Lactic acid
Z-Carbon dioxide + Water + Energy
- (c) X-Lactic acid + Energy
Y-Ethanol + Carbon dioxide + Energy
Z-Carbon dioxide + Water + Energy
- (d) X-Ethanol + Carbon dioxide + Energy
Y-Lactic acid + Energy
Z-Carbon dioxide + Water + Energy

Q.15. Observe the given diagram and identify the process and its significance from the following options. **COMPETENCY**



- (a) **Evaporation:** maintains water contents in leaf cells.
- (b) **Transpiration:** creates a suction force which pulls water inside the plant.
- (c) **Excretion:** helps in excreting out waste water from the plant.
- (d) **Trans-location:** helps in transporting materials from one cell to another.

Q.16. Given below is a diagrammatic representation of a process taking place in the human body. **COMPETENCY**



In which of these regions/organs could it be occurring?

- (i) lungs
- (ii) heart
- (iii) brain
- (a) only in (i)
- (b) only in (ii)
- (c) only in (i) and (ii)
- (d) in all (i), (ii) and (iii)

Q.17. Which of the following statement (s) is (are) true about heart?

- (i) Left atrium receives oxygenated blood from different parts of body while right atrium receives deoxygenated blood from lungs.
- (ii) Left ventricle pumps oxygenated blood to different body parts while right ventricle pumps deoxygenated blood to lungs.
- (iii) Left atrium transfers oxygenated blood to right ventricle which sends it to different body parts.
- (iv) Right atrium receives deoxygenated blood from different parts of the body while left ventricle pumps oxygenated blood to different parts of the body. **[NCERT Exemplar]**

- (a) (i)
- (b) (ii)
- (c) (ii) and (iv)
- (d) (i) and (iii)

Q.18. Single circulation i.e., blood flows through the heart only once during one cycle of passage through the body, is exhibited by **COMPETENCY**

- (a) Labeo, Chameleon, Salamander
- (b) Hippocampus, Exocoetus, Anabas
- (c) Hyla, Rana, Draco
- (d) Whale, Dolphin, Turtle

Q.19. Choose the correct statement that describes arteries. **COMPETENCY**

- (a) They have thick elastic walls, blood flows under high pressure; collect blood from different organs and bring it back to the heart.
- (b) They have thin walls with valves inside, blood flows under low pressure and carry blood away from the heart to various organs of the body.
- (c) They have thick elastic walls, blood flows under low pressure; carry blood from the heart to various organs of the body.
- (d) They have thick elastic walls without valves inside, blood flows under high pressure and carry blood away from the heart to different parts of the body.

Q.20. What prevents backflow of blood inside the heart during contraction?

- (a) Valves in heart
- (b) Thick muscular walls of ventricles
- (c) Thin walls of atria
- (d) All of the above

Q.21. Choose the forms in which most plants absorb nitrogen

- (i) Proteins
- (ii) Nitrates and Nitrites
- (iii) Urea
- (iv) Atmospheric nitrogen

[NCERT exemplar]

- (a) (i) and (ii)
- (b) (ii) and (iii)
- (c) (iii) and (iv)
- (d) (i) and (iv)

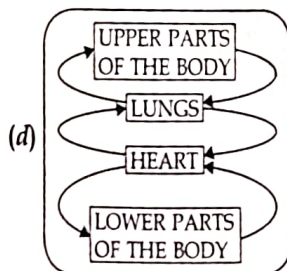
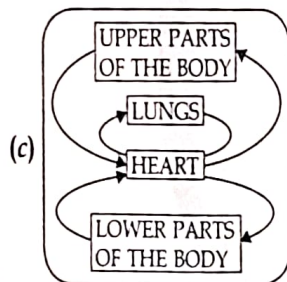
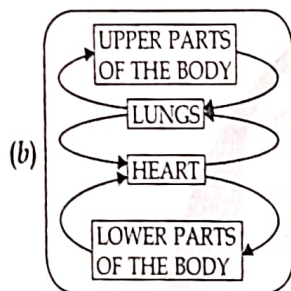
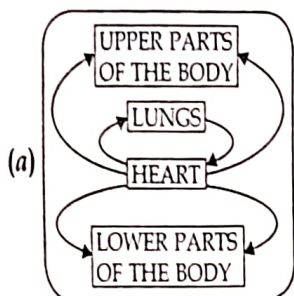
Q.22. Choose the correct path of urine in our body. **COMPETENCY**

- (a) kidney → ureter → urethra → urinary bladder
- (b) kidney → urinary bladder → urethra → ureter
- (c) kidney → ureters → urinary bladder → urethra
- (d) urinary bladder → kidney → ureter → urethra

Q.23. An artificial kidney is a device to remove nitrogenous waste products from the blood through a treatment called ____?

- (a) Hemodialysis (b) Dialysis
(c) Vena cava (d) None of these

Q.24. Which of these flowcharts correctly shows the circulation of blood in the human body? **COMPETENCY**



— Assertion Reason Questions —

Following questions consist of two statements: Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

- (a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, and R is not the correct explanation of A.

- (c) A is true but R is false.
(d) A is false but R is true.

Q.1. Assertion (A): The inner walls of the small intestine have finger like projections called villi which are rich in blood.

Reason (R): These villi have a large surface area to help the small intestine in completing the digestion of food.

[CBSE 2023]

Q.2. Assertion (A): Amoeba takes in food using finger like extensions of the cell surface.

Reason (R): In all unicellular organisms, the food is taken in by the entire cell surface. **COMPETENCY**

Q.3. Assertion (A): When a green leaf is dipped in alcohol, the alcohol solution turns green.

Reason (R): The color change of alcohol occurs because chlorophyll is dissolved in alcohol, causing the alcohol to turn green.

Q.4. Assertion (A): ATP is the energy currency for most cellular processes.

Reason (R): Break down of glucose in yeast results in formation of 2- carbon molecules (ethanol), carbon dioxide and energy. **COMPETENCY**

Q.5. Assertion (A): Warm-blooded animals have their left and right side of the heart separated for more efficient supply of oxygen to the body.

Reason (R): Warm-blooded animals need high energy to maintain their body temperatures. **COMPETENCY**

Q.6. Assertion: Pressure is much greater in veins than in arteries.

Reason (R): The force that blood exerts against the wall of a vessel is called blood pressure.

Q.7. Assertion (A): Many plant waste products are stored in cellular vacuoles.

Reason (R): The excretory system of human beings includes a pair of kidneys, a pair of ureters, a urinary bladder and a urethra.

ANSWERS

Multiple Choice Answers

1. (d) 2. (b) 3. (b) 4. (b)
5. (b)
6. (d)

Free advice: Plants store energy in form of starch and animals store it in the form of glycogen.

7. (c) 8. (b) 9. (b) 10. (b)
11. (d) 12. (a) 13. (c)
14. (d)

FREE ADVICE: When the terminal phosphate linkage in ATP is broken using water, the energy equivalent to 30.5 kJ/mol is released.

15. (b) 16. (d) 17. (c) 18. (b)
19. (d)

FREE ADVICE: The pressure of blood inside the artery during ventricular systole is called systolic pressure and pressure in artery during ventricular diastole is called diastolic pressure

20. (a)

FREE ADVICE: Blood pressure is measured with an instrument called sphygmomanometer.

21. (b) 22. (c)
23. (b) 24. (c)

Assertion-Reason Answers

1. (c) A is true but R is false.

Explanation. These villi help in the absorption of digested nutrients but do not play a role in the actual process of food digestion.

2. (c) A is true but R is false.
3. (a) Both A and R are true, and R is the correct explanation of A.
4. (b) Both A and R are true, and R is not the correct explanation of A.
5. (a) Both A and R are true, and R is the correct explanation of A.
6. (d) A is false but R is true.
7. (b) Both A and R are true, and R is not the correct explanation of A.

SUBJECTIVE QUESTIONS

— Very Short Answer Questions —

Q.1. Differentiate between alveoli and nephron on the basis of the following points:

COMPETENCY

Sr. No.	Feature	Alveoli	Nephron
1.	Structure and location		
2.	Function		

Ans. Difference between Alveoli and Nephron

Sr. No.	Feature	Alveoli	Nephron
1.	Structure and location	• Balloon like structures present at the terminal ends of bronchioles in lungs	Tubular structure present in kidneys
2.	Function	Exchange of gases	Filtration of blood to form urine

Q.2. Name the stored food of animals and plants.

COMPETENCY

Ans. Animal - Glycogen, Plant - Starch

Q.3. What advantages over an aquatic organism does a terrestrial organism have with regard to obtaining oxygen for respiration?

COMPETENCY

Ans. Aquatic organisms obtain oxygen from the dissolved oxygen in water, which is present in lower concentrations compared to the oxygen in the air. While, terrestrial organisms can intake larger quantities of oxygen in a single breath compared to aquatic organisms.

Q.4. Name the respiratory pigment in human beings. Where is this pigment found?

[CBSE 2014]

Ans. The respiratory pigment in human beings is known as hemoglobin, which is found within the red blood cells (RBCs) in humans.

Q.5. The figures P and Q show the state of the heart at stages of the cardiac cycle.

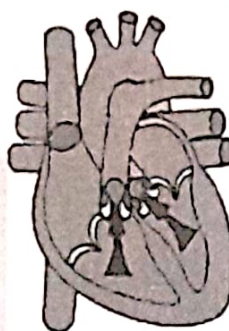


Figure P

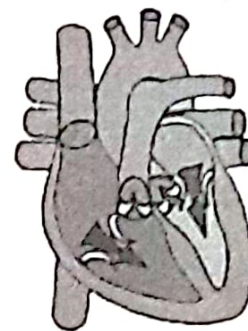


Figure Q

Identify the blood pressure values that will be obtained at the stages of the heart, shown in figures P and Q, for a normal person at rest.

COMPETENCY

Ans. Figure P = 120

Figure Q = 80

Q.6. Why do the walls of the trachea not collapse when there is less air in it?

COMPETENCY

Ans. Due to presence of rings of cartilage in the throat ensures that the air passage does not collapse.

Q.7. What is the function of platelet cells in blood?

[CBSE 2013, 14, 17]

Ans. The platelet cells aid in clotting the blood and prevent bleeding at the site of injury.

Q.8. Name the tissues which-

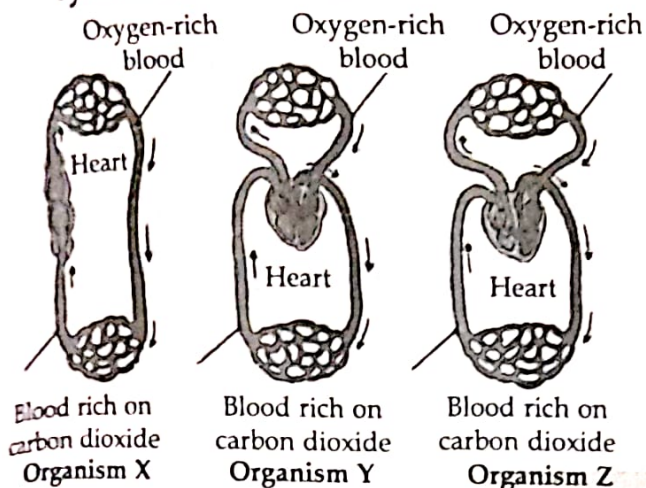
- transport soluble products of photosynthesis in plants,
- transport water and minerals in a plant.

[CBSE 2019]

Ans. (a) Phloem,

(b) Xylem

Q.9. Shown below are the diagrammatic representations of the circulatory systems of three organisms X, Y and Z.



(a) Identify which organism is a fish.

Give a reason for your answer.

(b) Identify the organism(s) that does/do not require energy to maintain their body temperature.

Ans. (a) Organism X –

- fishes have a two-chambered heart.
- In fishes, the blood passes through the heart only once during one cycle.

(b) - Organism X
- Organism Y

Q.10. Mention the purpose of making urine.

COMPETENCY

Ans. The purpose of producing urine is to separate waste products (urea or uric acid) from the bloodstream.

Q.11. Name the process by which plants get rid of excess water. Name the pores through which this process takes place.

COMPETENCY

Ans. Transpiration is the process by which plants get rid of excess water. Stomatal pores are the pores through which transpiration takes place.

Q.12. What are final products of carbohydrates, proteins and fats after their digestion? [CBSE 2020]

Ans. Carbohydrates → Glucose
Proteins → Amino acid
Fats → Glycerol + Fatty acid

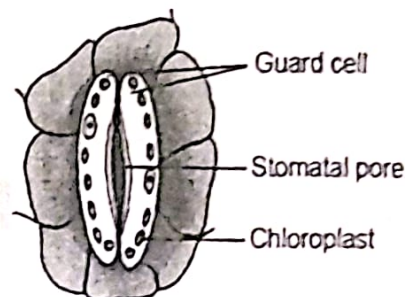
(DAY 32)

Short Answer Questions

Q.1. A student is observing the temporary mount of a leaf peel under a microscope. Draw labelled diagram of the structure as seen under the microscope.

COMPETENCY

Ans.



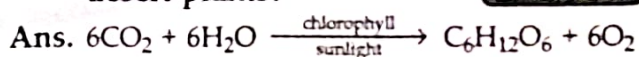
Q.2. Give two reasons, why bile juice is considered to be an important secretion of liver in the process of digestion?

[CBSE 2023]

Ans. Use of bile juice:

- Bile makes the acidic food coming from the stomach alkaline, so that pancreatic enzymes can act on it.
- Bile salts break the fats present in the food into small globules making it easy for the enzymes to act and digest them.

Q.3. Represent the equation of photosynthesis. Explain the steps involved in photosynthesis. In which way are the steps of photosynthesis different in desert plants? **COMPETENCY**



Three processes that take place during photosynthesis include:

- Chlorophyll absorbing light energy.
- Conversion of light energy into chemical energy and the splitting of water into hydrogen and oxygen.
- Reduction of CO_2 to form carbohydrates. Desert plants absorb CO_2 at night and produce an intermediate molecule. This intermediate molecule is then processed with the energy absorbed by chlorophyll during the day to produce carbohydrates.

Q.4. Give the name of the enzyme present in the fluid in our mouth cavity. State the gland which produces it. What would happen to the digestion process if this gland stops secreting this enzyme?

[CBSE 2023]

Ans. The enzyme salivary amylase is found in the liquid within our oral cavity. Salivary glands located in our mouth generate saliva.

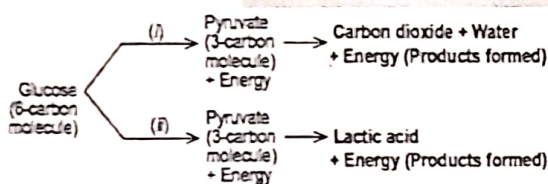
If these glands cease to produce saliva, the breakdown of starch will not take place within the mouth. Additionally, the moistening of food will be absent, making the process of swallowing food challenging.

Q.5. Write two different ways in which glucose is oxidized to provide energy in human body. Write the products formed in each case.

COMPETENCY

Ans. (a) Aerobic respiration in presence of oxygen in Mitochondria.

(b) Aerobic respiration in lack of oxygen in muscle cells.



Q.6. Amount of urine produced generally decreases in summers as compared to other seasons if we don't keep ourselves sufficiently hydrated. Justify.

Ans. The amount of urine produced is regulated by selective reabsorption in the renal tubule of the nephron. It depends on how much excess water is there in the body and how much dissolved waste is there to be excreted. In summers more water is lost due to sweating so there is more reabsorption of water by the body to maintain osmotic balance.

Q.7. List in tabular form the two differences between aerobic and anaerobic respiration. Why do we feel cramps in our muscles during sudden physical activity?

[CBSE 2014]

Ans.

	Anaerobic Respiration	Aerobic Respiration
(i)	Generates small amount of energy.	Generates a large amount of energy.
(ii)	Occurs in the absence of oxygen.	Occurs in the presence of oxygen.
(iii)	The end products are lactic acid and carbon dioxide.	The end products are carbon dioxide and water

We feel cramps in our muscles during sudden physical activity because When there is an insufficient supply of oxygen to our muscle cells, it leads to the formation of lactic acid through the breakdown of pyruvate, resulting in the occurrence of muscle cramps in the body.

Q.8. What is the other name of 'tissue fluid'? Write its two functions. [CBSE 2023]

Ans. Tissue fluid is also called lymph.

Functions of lymph:

1. Lymph protects the body by killing the germs drained out of the body tissue with the help of lymphocytes, and by making antibodies,
2. Lymph carries digested fat (which is a large molecule and could not be absorbed by blood stream) for the nutritive process.
3. Lymph helps in removing the waste products like fragments of dead cells etc.

Q.9. Water is used by the leaves of the plants for photosynthesis but rather than watering the leaves, we water the plant through the soil. How does this water reach the leaves of the plant?

Ans. Most plants secure their water and minerals from their roots. Minerals travel through plants as dissolved substances in water. Water and minerals are transported through xylem cells from the soil to the leaves. The xylem cells of roots, stem and leaves are interconnected to form a conducting channel. The root cells take ions from the soil. This creates a difference between the concentration

of ions of roots and soil. Therefore, there is a steady movement of water into xylem. An osmotic pressure is formed and water and minerals are transported from one cell to the other due to osmosis. The continuous loss of water takes place due to transpiration.

Q.10. What do the following transport?

- (a) Xylem
- (b) Pulmonary artery
- (c) Pulmonary veins
- (d) Phloem

[CBSE 2011, 12]

Ans. (a) Xylem → water and minerals in plants.

(b) Pulmonary artery → de-oxygenated blood from heart to lungs.

(c) Pulmonary veins → oxygenated blood from lungs to heart.

(d) Phloem → synthesised food in plants.

Q.11. State any two differences between arteries and veins. [CBSE 2014]

Ans.

	Arteries	Veins
(i)	Valves are absent in arteries	Valves are present in veins
(ii)	Wall of the arteries are thick	Wall of the veins are thin
(ii)	Arteries carry blood towards the heart except pulmonary arteries.	Veins carry blood away from the heart except pulmonary veins.

Q.12. Write one specific function each of the following organs in relation with excretion in human beings:

- (a) Renal Artery
- (b) Urethra
- (c) Glomerulus
- (d) Tubular part of nephron

COMPETENCY

Ans. (a) **Renal Artery.** The Renal Artery brings in the dirty blood containing waste substances (nitrogenous waste like urea etc.) into the kidneys.

(b) **Urethra.** The urine collected in the bladder is passed out from the body through the urethra.

(c) **Glomerulus.** One end of the glomerulus is attached to renal artery which brings the dirty containing the urea waste into it. The glomerulus filters this blood. During filtration, the substances like glucose, amino acids, salts, water and urea etc. present in the blood of glomerulus pass into Bowman's capsule.

(d) **Tubular part of nephron.** When the filtrate containing useful substances as well as the waste substances passes through the tubule, then the useful substances like glucose, all amino acids, most salts and most water etc. are reabsorbed into the blood through blood capillaries surrounding the tubule. Only the waste substances urea, some unwanted salts and excess water remain behind in the tubule in the form of urine

Q.13. What are the methods used by plants to get rid of excretory products?

COMPETENCY

Ans. *Plants can get rid of excretory products in many ways like:*

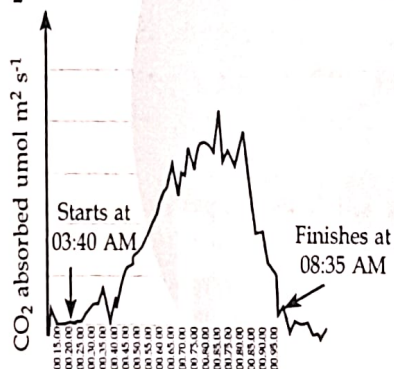
- (a) The removal of liquid waste (water) through stomata pores via transpiration.
- (b) To get rid of gaseous waste products through stomata pores, where CO₂ is released during respiration, and O₂ is emitted during photosynthesis.
- (c) Remaining waste products are stored within deceased leaf cells, and when leaves eventually detach, these wastes are shed. Some additional waste materials, like resins and gums, accumulate within the aging xylem of the plant. Furthermore, certain waste materials are discharged from nodes into the soil.

Q.14. List the steps for the synthesis of glucose by the plants. What special feature is found in desert plants related to this process?

Ans. Steps of synthesis of glucose by the plants:

- Absorption of sunlight energy by chlorophyll.
- Conversion of light energy into chemical energy and splitting of water molecules into hydrogen and oxygen by light energy.
- Reduction of carbon dioxide by hydrogen to form carbohydrates like glucose by utilising the chemical energy (obtained by the transformation of light energy).
Desert plants take up carbon dioxide (CO_2) at night and prepare an intermediate which is acted upon by the energy absorbed by the chlorophyll during the day.

Q.15. The graph below shows the hours of the day during which a plant absorbs CO_2 . [CBSE 2024]



- In what kind of weather conditions is this plant likely to be growing? Give a reason to support your answer.
- When is photosynthesis likely to happen in such plants?

Ans. (a) Condition. In dry and arid conditions/deserts.

Reason. Since gas exchange is not happening in the day, it indicates that stomata is likely to be closed, which is common in dry conditions.

(b) in the day

Q.16. Explain the role of the following enzymes in the process of digestion of food in humans: [COMPETENCY]

- Salivary amylase
- Pepsin
- Trypsin
- Lipase

Ans. Role of the enzymes in the process of digestion of food in humans:

- Salivary amylase.** It breaks down starch with complex molecules to sugar.
- Pepsin.** It helps to digest proteins into smaller peptides and amino acids in stomach.
- Trypsin.** It helps in digesting proteins to amino acids and it is found in the small intestine of mammals.
- Lipase.** Breaking down of emulsified fats to fatty acids and glycerol.

(DAY 33)

Long Answer Questions

Q.1. (i) Draw a diagram of human alimentary canal and label the following parts:

- largest gland.
- gland that secretes digestive enzymes and hormone.
- part where HCl is produced.
- part where digested food is absorbed.
- part which stores bile until it's needed for digestion.

(ii) What are villi? Explain their function in the digestive system.

[CBSE 2020]

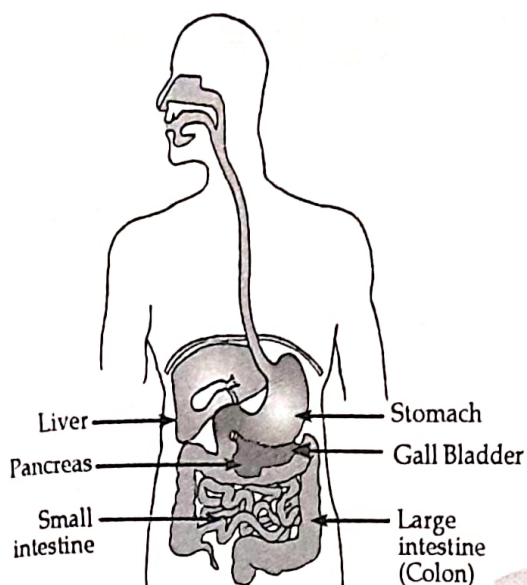
Ans. (i) (a) Largest gland – *Liver*

(b) Gland that secretes digestive enzymes and hormone – *Pancreas*

(c) Part where HCl is produced – *Stomach*

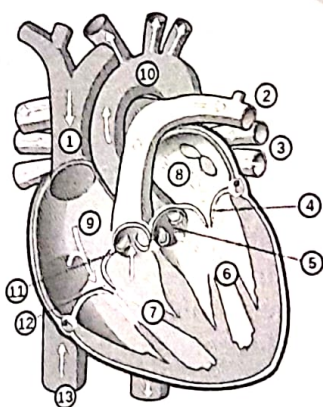
(d) Part where digested food is absorbed – *Small intestine*

(e) Part which stores bile until its needed for digestion – *Gall Bladder*



(ii) The small intestine is uniquely designed for the absorption of digested nutrients. The interior lining of the small intestine is covered in millions of small, finger-like structures known as villi, significantly increasing the surface area of the intestinal walls. This expanded surface area facilitates the maximum absorption of digested nutrients. The villi are abundantly equipped with blood vessels that transport the absorbed nutrients to every cell in the body.

Q.2. (a) Which chamber of the heart (6, 7, 8 or 9) pumps blood to the lungs for oxygenation, name it? Identify and name the blood vessels that carry blood to the lungs. [CBSE 2024]



(b) Identify the structure at number 12 and state its function.

(c) Why do chambers 6 and 7 have thicker muscular walls than chambers 8 and 9? Name each of these chambers.

Ans. (a) 7 – Right ventricle,
2 – Pulmonary arteries

(b) Valves. They ensure that blood does not flow backwards when atria or ventricles contract.

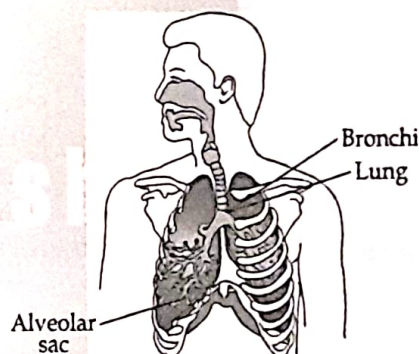
(c) Left and right Ventricles (6 and 7) have thicker walls as compared to left and right atria (8 and 9). They have to pump blood out of the heart. They pump blood at a higher pressure to ensure it reaches all parts of the body.

Q.3. (a) Draw the human respiratory system and label the following-
lung, bronchi and alveolar sac.

(b) During breathing cycle, what is the advantage of residual volume of air in lungs?

COMPETENCY

Ans. (a)



(b) Advantage of residual volume of air in lungs is to ensure that there is sufficient time for oxygen to be absorbed and for CO_2 to be discharged.

Q.4. There are different nutrients required by the human body. These are in 3 major categories of carbohydrates, fats and proteins (apart from vitamins, minerals and roughage).

(a) Digestion of nutrient R happens in the stomach. Identify R.

(b) Consider fats and oils from your diet as large globules in your digestive tract.

Name the reaction that can help in making these easier to absorb.

- (c) What is the difference in the kind of medium required for digestive enzymes in the stomach and the small intestine to work? **COMPETENCY**

Ans. (a) protein

(b) emulsification

(c) Digestive enzymes in the stomach need an acidic medium while those in the small intestine need an alkaline medium.

Q.5. Explain the process of transport of oxygenated and deoxygenated blood in a human body. [CBSE 2023]

Ans. All the animals like humans having four chambered hearts have double circulation in which the blood passes through the heart 'twice' in one complete cycle of the body. This ensures the separation of oxygenated blood from deoxygenated blood.

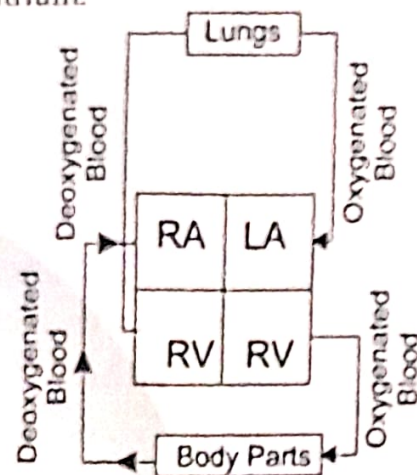
Explanation.

Double circulation. The blood travels twice through the heart in one complete cycle of the body and is called double circulation. It involves two circulations:

(a) **Pulmonary circulation.** The pathway of the blood from the heart to the lungs and back to the heart is called pulmonary circulation. It is a small circulation. Deoxygenated blood in the right ventricle flows into the vascular system of the lungs, becomes oxygenated and returns to the heart's left atrium through pulmonary veins.

(b) **Systemic circulation.** The pathway of the blood from the heart to the rest of the body and back to the heart is called systemic circulation. It is a large circulation. Left ventricle

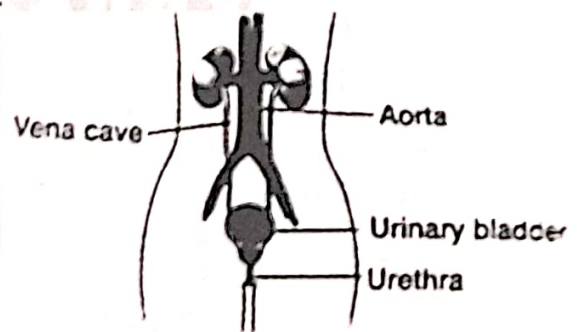
sends the blood into the **aorta**. Aorta divides into arteries, arterioles and capillaries and supplies oxygenated blood to various parts of the body. From there the deoxygenated blood is collected by venules, which join to form veins and finally vena cava and pours blood back into the right atrium.



Q.6. (a) Draw a diagram of excretory system in human beings and label on it: Aorta, Vena cava, Urinary bladder, Urethra.

(b) List two vital functions of the kidney. **COMPETENCY**

Ans.

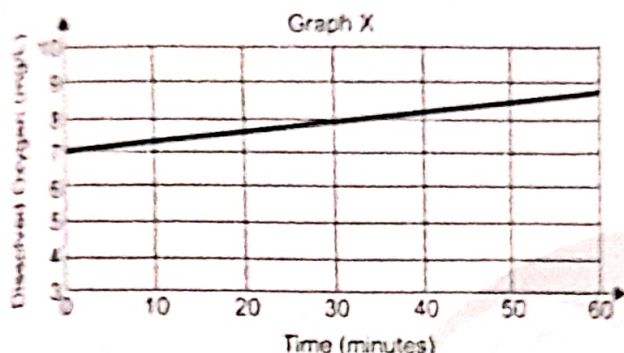


Two vital functions of kidney are:

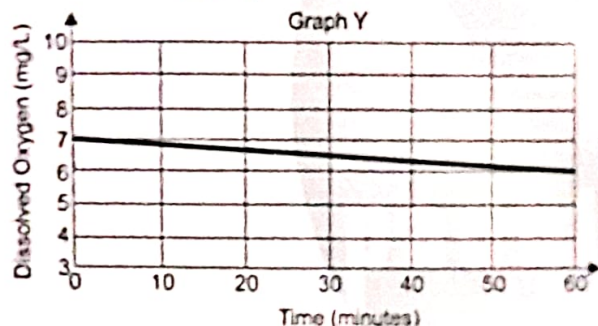
- The kidney purifies the blood by separating waste substances, forming urine.
- Kidneys keep the body's pH and salt levels stable, as well as regulating water equilibrium.

CASE BASED QUESTIONS

Q1. Anita conducted an experiment to examine photosynthesis in aquatic plants kept in a tank by measuring dissolved oxygen. She plotted her results in the following graph X:



She repeated the experiment while covering the tank with an opaque black cloth. She plotted the results in the following graph Y:



Answer the following questions

- What could be the aim of her experiment? **COMPETENCY**
- Apart from photosynthesis, what other cellular process can be observed by the experiment?
- Explain the downward slope of the graph Y. **COMPETENCY**

Ans. (a) To show that light is necessary for photosynthesis.

(b) Respiration

(c) The downward slope depicts that dissolved oxygen is used up by the plant for respiration but no new oxygen is produced as the plant does not perform photosynthesis in absence of light.

Q2. Not all plants carry out photosynthesis by the same mechanism. In most plants, photosynthesis depends directly on the gaseous carbon dioxide that diffuses into the leaf through the stomata. However, some plants such as pineapple have the ability to store carbon dioxide in the vacuoles of the leaf cells as part of a complex carbon compound. This complex compound is transported to the chloroplasts and releases carbon dioxide when required, for photosynthesis to occur. This special photosynthesis mechanism is believed to have evolved as an adaptation to conserve water for survival in dry conditions.



Answer the following questions

- Which process in the plants does this photosynthesis mechanism minimise to help the plant survive in dry conditions?
- How is the ability to store carbon dioxide as a complex compound likely to help minimise the process referred to in (a)? **COMPETENCY**
- When are such plants likely to take in carbon dioxide from the environment? **COMPETENCY**

Ans. (a) Transpiration

(b) Since stored carbon dioxide can be used, stomata need not be open for photosynthesis to occur during the

day. Keeping the stomata closed during the day helps to minimise water loss due to transpiration.

(c) during the night

Q.3. Terrestrial animals use lungs to breathe while aquatic animals like fishes use gills to absorb dissolved oxygen in water. Frogs are organisms that can survive both in water and on land.



Answer the following questions

(a) How does a frog acquire oxygen while it is underwater?

(b) Are lungs of terrestrial animals and gills of fishes analogous organs? Explain why or why not. **COMPTON**

(c) Why do aquatic animals have a higher breathing rate than terrestrial animals? **COMPTON**

Ans. (a) Frog's skin is thin and permeable to oxygen and water. It takes up the dissolved oxygen from the water through the process of diffusion.

(b) Yes, they are analogous organs. Because they have different structure but similar function.

(c) Amount of dissolved oxygen in water is lower as compared to oxygen present in the air. Hence aquatic animals have to breathe faster.

(DAY 33 SWAHA)

padhleakshay

DAY 33

“Congratulate yourself on completing your 33 days journey. Share your experience with others via video review on ‘Amazon’, ‘FlipKart’, and ‘Instagram’—

@padhle.akshay.”

— Akshay Bhaiya





Available On
amazon



1

For Solutions



Sample Question Paper

Time Allowed: 3 hours

Maximum Marks: 80

General Instructions:

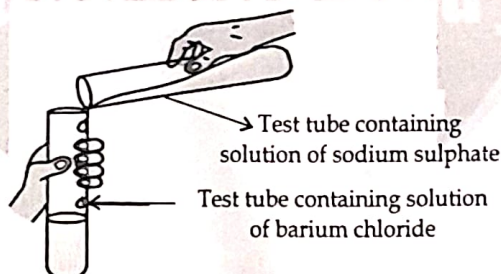
1. All questions would be compulsory. However, an internal choice of approximately 33% would be provided. 50% marks are to be allotted to competency-based questions.
2. Section A would have 16 simple/complex MCQs and 04 Assertion-Reasoning type questions carrying 1 mark each.
3. Section B would have 6 Short Answer (SA) type questions carrying 02 marks each.
4. Section C would have 7 Short Answer (SA) type questions carrying 03 marks each.
5. Section D would have 3 Long Answer (LA) type questions carrying 05 marks each.
6. Section E would have 3 source based/case based/passage based/integrated units of assessment (04 marks each) with sub-parts of the values of 1/2/3 marks.

SECTION-A

Questions 1 to 16 are Multiple Choice Questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

Q.1.

1

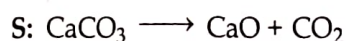
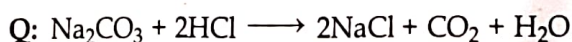
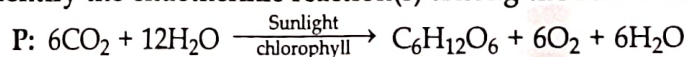


Identify the product which represents the solid state in the above reaction.

- | | |
|---------------------|---------------------|
| (a) Barium chloride | (b) Barium sulphate |
| (c) Sodium chloride | (d) Sodium sulphate |

Q.2. Identify the endothermic reaction(s) among the following:

1



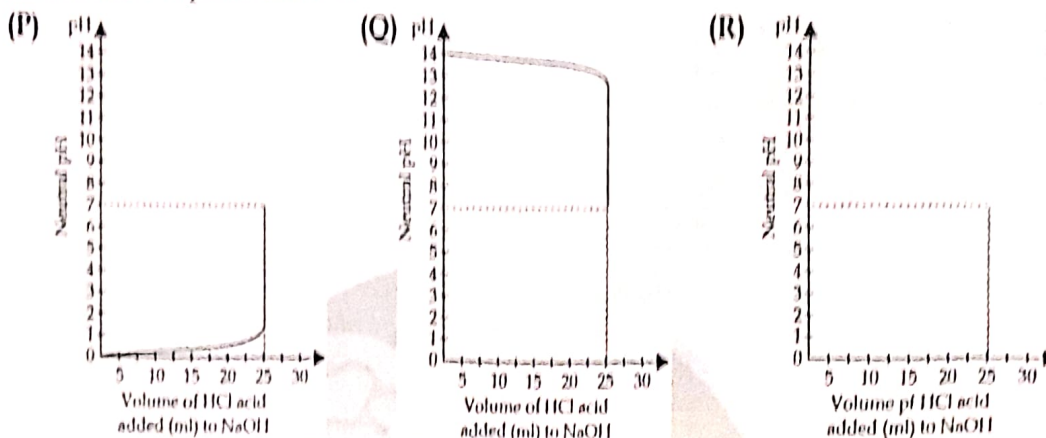
Options:

- | | | | |
|------------|------------|------------------|------------------|
| (a) only P | (b) only S | (c) only Q and R | (d) only P and S |
|------------|------------|------------------|------------------|

Q.3. In the neutralization reaction when excess of acid is added to an alkali, salt and water are produced. What is the nature of the solution after the reaction occurs? 1

- (a) Amphoteric (b) Acidic (c) Basic (d) Neutral

Q.4. Aditi adds drop wise 25 ml of concentrated HCl to 25 ml of concentrated NaOH and continuously monitors the pH in the mixture. She finds that the pH of the mixture at the end of the experiment is 7. 1



Which of the following graph correctly demonstrates the change in pH in the mixture during the experiment?

- (a) only (P) (b) only (Q)
(c) either (P) or (Q) (d) any of them (P), (Q) or (R)

Q.5. What is the saturated solution of Sodium Chloride called? 1

- (a) Brine (b) Lime water (c) Slaked lime (d) Soda water

Q.6. Galvanisation is a process of coating iron articles with a layer of zinc to prevent the iron from rusting. The iron is protected even if the zinc coating is scratched and iron is exposed. 1

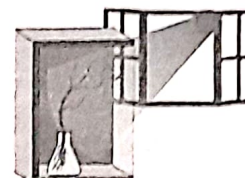
Which of the following is true about how zinc prevents the rusting of iron?

- (P) A galvanised iron article does not undergo oxidation.
(Q) The zinc coating prevents contact of iron with air.
(R) Zinc undergoes corrosion more easily than iron.
(a) only (P) (b) only (Q) (c) only (P) and (Q) (d) only (Q) and (R)

Q.7. Akshay potted some germinated seeds in a pot. He put the pot in a cardboard box that was open from one side. He keeps the box in a way that the open side of box faces sunlight near his window. After 2-3 days he observes the shoot bends towards light as shown in image.

Which type of tropism he observes? 1

- (a) Geotropism (b) Phototropism
(c) Chemotropism (d) Hydrotropism



Q.8. A feature of reproduction that is common to Amoeba, Yeast and Spirogyra is that 1

- (a) they reproduce asexually. (b) they are all unicellular.
(c) they reproduce only sexually. (d) they are all multicellular.

Q.9. Height of a plant is regulated by: 1

- (a) DNA which is directly influenced by growth hormone.
(b) Genes which regulate the proteins directly.
(c) Growth hormones under the influence of the enzymes coded by a gene.
(d) Growth hormones directly under the influence of a gene.

Q.10. Which of the following are energy foods?

1

- (a) Carbohydrates and fats (b) Proteins and mineral salts
(c) Vitamins and minerals (d) Water and roughage

Q.11. A man with blood group A marries a woman having blood group O. What will be the blood group of the child?

1

- (a) O only
(b) A only
(c) AB
(d) Equal chance of acquiring blood group A or blood group O.

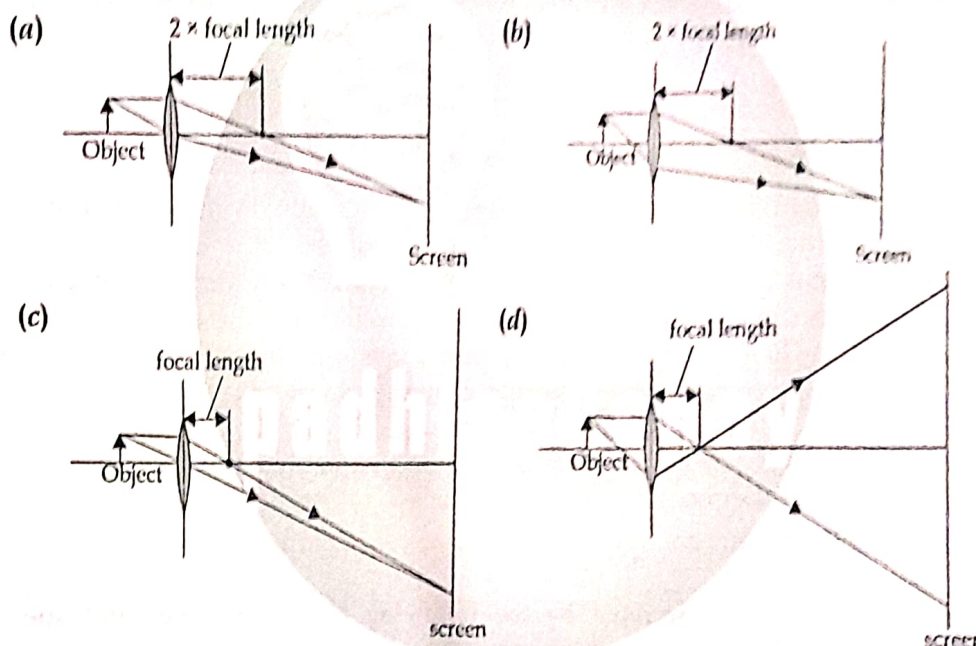
Q.12. If the real image of a candle flame formed by a lens is three times the size of the flame and the distance between lens and image is 80 cm, at what distance should the candle be placed from the lens?

1

- (a) -80 cm (b) -40 cm (c) $-\frac{40}{3}$ cm (d) $-\frac{80}{3}$ cm

Q.13. Which diagram shows image formation of an object on a screen by a converging lens?

1



Q.14. The maximum resistance which can be made using four resistors each of resistance $\frac{1}{2} \Omega$ is

1

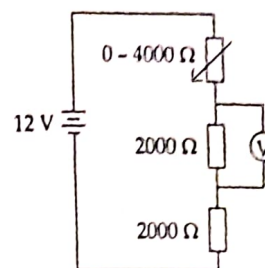
- (a) 2Ω (b) 1Ω (c) 2.5Ω (d) 8Ω

Q.15. The circuit given here consists of a variable resistor connected in series with two 2000Ω resistors. The variable resistor can be adjusted to any value between $0 - 4000 \Omega$.

1

As the resistance of the variable resistor is changed, what is the smallest possible reading on the voltmeter?

- (a) 0 V (b) 3 V
(c) 4 V (d) 6 V



Q.16. The direction of force on a current carrying conductor in a magnetic field is given by 1

- (a) Fleming's left hand rule. (b) Fleming's right hand rule.
(c) Right hand thumb rule. (d) Left hand thumb rule.

Question No. 17 to 20 consist of two statements—Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option given below:

- (a) Both (A) and (R) are true and (R) is the correct explanation of (A).
- (b) Both (A) and (R) are true and (R) is not the correct explanation of (A).
- (c) (A) is true but (R) is false.
- (d) (A) is false but (R) is true.

- Q.17. Assertion (A): Silver bromide decomposition is used in black and white photography. 1
Reason (R): Light provides energy for this exothermic reaction
- Q.18. Assertion (A): Ammonia solution melts when exposed to air. 1
Reason (R): Ammonia solution turns blue litmus paper red.
- Q.19. Assertion (A): Raw materials needed for photosynthesis are carbon dioxide, water and minerals. 1
Reason (R): Nutrients provide energy to an organism.
- Q.20. Assertion (A): A convex mirror is used as a driver's mirror. 1
Reason (R): Because convex mirror's field of view is large and images formed are virtual, erect and diminished.

SECTION-B

Question No. 21 to 26 are very short answer questions.

- Q.21. Write the balanced chemical equation with the state symbols of the following reaction: 2
- (i) Solutions of Barium chloride and Sodium sulphate in water react to give insoluble Barium sulphate and the solution of Sodium chloride.
 - (ii) Sodium hydroxide solution (in water) reacts with hydrochloric acid solution (in water) to produce sodium chloride solution and water.
- Or
- (i) "Alkanes generally burn with clean flame." Why?
 - (ii) Draw the electron dot structure for ethane.

- Q.22. List two different functions performed by pancreas in our body. 2
- Or

Name the hormones secreted by the following endocrine glands and specify one function of each:

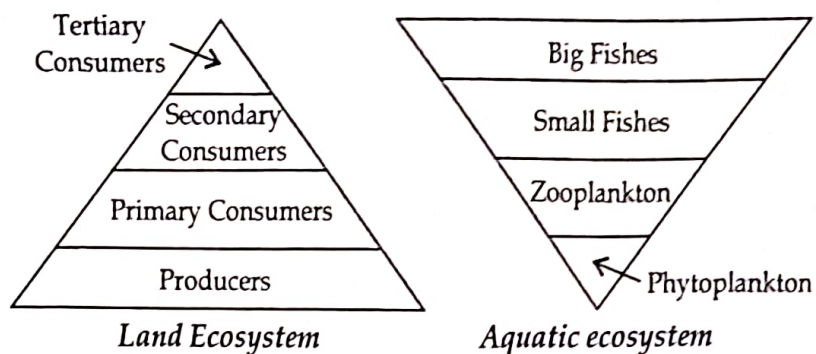
- (a) Thyroid (b) Pituitary (c) Pancreas
- Q.23. (a) Name one gustatory receptor and one olfactory receptor present in human beings. 2
(b) Write a and b in the given flow chart of neuron through which information travels as an electrical impulse.



- Q.24. White light is passed through a prism to yield a spectrum. 2
- (a) The ray of which colour will show the maximum angle of deviation and which one will show the least angle of deviation?
 - (b) A blue-coloured ray is passed through a glass prism. What will be the colour of the emergent ray? Justify your answer.
- Q.25. What is fragmentation in organisms? Name a multicellular organism which is reproduced by this method. 2

Q.26. Shown below are two food pyramids.

2



The pyramid representing the land ecosystem is traditional with producers being greater in mass than primary consumers and so on. Sometimes, in aquatic ecosystems, an inverted pyramid exists. Here, the total mass of producers (phytoplankton) is much smaller than the top consumers (big fishes).

- Which level is likely to have the most amount of energy in such an aquatic ecosystem? Give a reason to support your answer.
- Such aquatic ecosystems are considered to be unstable. Justify this statement.

SECTION-C

Questions No. 27 to 33 are short answer questions.

Q.27. You are provided with three test tubes C, A and B which contain distilled water, acidic solution and basic solution. If you are given blue litmus paper only, how will you identify the contents of each test tube? 3

Q.28. A reddish brown coloured metal, used in electrical wires, when powdered and heated strongly in an open china dish, its colour turns black. When hydrogen gas is passed over this black substance, it regains its original colour. 3

Based on the above information, answer the following questions:

- Name the metal and the black coloured substance formed.
- Write balanced chemical equations for both the reactions.

Q.29. Define the term transpiration. Design an experiment to demonstrate this process. 3

Or

Write *three* types of blood vessels. Give one important feature of each.

Q.30. List two possible ways in which a concave mirror can produce a magnified image of an object placed in front of it. State the difference, if any, between these two images. 3

Q.31. "Energy flow in a food chain is unidirectional." Justify this statement. Explain how the pesticides enter a food chain and subsequently get into our body. 3

Q.32. With the help of a diagram, differentiate between a converging and diverging lens. State one use of a convex lens. 3

Q.33. The image formed by a spherical mirror is real, inverted and is of magnification -2 . If the image is at a distance of 30 cm from the mirror, where is the object placed? Find the focal length of the mirror. List *two* characteristics of the image formed if the object is moved 10 cm towards the mirror. 3

SECTION-D

Questions no. 34 to 36 are Long Answer Questions.

Q.34. Given below are certain situations. Analyze and describe its possible impact on a person: 5

- (a) Testes of a male boy are not able to descend into scrotum during his embryonic development.
- (b) Vas deferens of a man is plugged.
- (c) Prostate and seminal vesicles are not functional.
- (d) Egg is not fertilised in a human female.
- (e) Placenta does not attach to the uterus optimally.

Or, (a) A doctor has advised Sameer to reduce sugar intake in his diet and do regular exercise after checking his blood test reports. Which disease do you think Sameer is suffering from? Name the hormone responsible for this disease and the organ producing the hormone. 3

(b) Which hormone is present in the areas of rapid cell division in a plant and which hormone inhibits the growth? 2

Q.35. (a) Draw a diagram to show spore formation in Rhizopus. 5

(b) With the help of an example differentiate between the process of Budding and Fragmentation.

Or

With the help of suitable diagrams, explain the various steps of budding in Hydra.

Q.36. What is meant by power of a lens? Define its S.I. unit. You have two lenses A and B of focal lengths +10 cm and -10 cm respectively. State the nature and power of each lens. Which of the two lenses will form a virtual and magnified image of an object placed 8 cm from the lens? Draw a ray diagram to justify your answer. 5

Or, A student wants to project the image of a candle flame on the walls of school laboratory by using a lens:

- (a) Which type of lens should he use and why?
- (b) At what distance in terms of focal length 'F' of the lens should he place the candle flame so as to get (i) a magnified, and (ii) a diminished image respectively on the wall?
- (c) Draw a ray diagram to show the formation of the image in each case.

SECTION-E

Questions No. 37 to 39 are case-based/data-based questions.

Q.37. A hydrocarbon is an organic chemical compound composed exclusively of hydrogen and carbon atoms. Hydrocarbons are naturally-occurring compounds and form the basis of crude oil, natural gas, coal, and other important energy sources. Hydrocarbons are highly combustible and produce carbon dioxide, water, and heat when they are burned. Therefore, hydrocarbons are highly effective as a source of fuel. 4

Study the table related to three hydrocarbons P, Q, R and answer the questions that follow:

Organic Compound	Molecular Compound
P	C_3H_8
Q	C_5H_{10}
R	C_4H_6

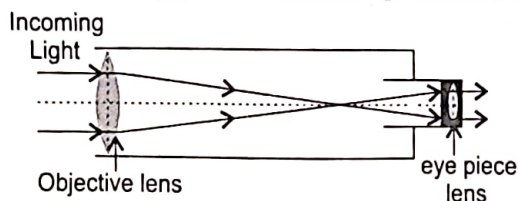
Now on the basis of reading of this para, write the answer the following questions.

- (a) Why the compounds P, Q and R are known as hydrocarbons? 1
 (b) What type of Hydrocarbons burn with blue flame and burn completely? 1
 (c) Name *two* types of unsaturated Hydrocarbons. 2

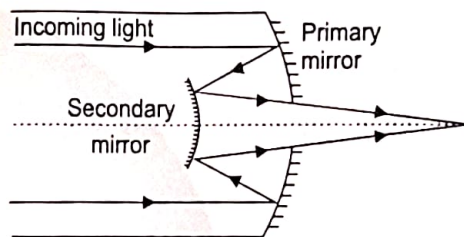
Or

- (c) Write the General molecular formula of alkanes. 2

Q.38. The image below shows the design of a refracting telescope. 4



When light passes through a prism different colours split and dispersion takes place. The same thing happens with a lens but to a much lesser degree. This is called chromatic aberration and causes the different colours of light to focus at different points. To overcome this problem, the reflecting telescope was invented. One design of the reflecting telescope is shown.



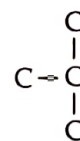
- (a) Why is there no chromatic aberration in reflecting telescopes? One of the critical factors affecting a telescope is the amount of light it can gather. The more light a telescope can gather, the better the image it produces. What can be done to the lens to increase the amount of light a telescope gathers? 1
 (b) In the refracting telescope given in the passage, what should be the distance between the two lenses? (Use the first ray diagram in the passage to answer it.) 1
 (c) The light that reaches the telescopes comes from very far away celestial objects. Draw a ray diagram to show what happens when light from a far away object falls on a convex lens and a concave lens. 2

Or

- (c) The light that reaches the telescopes comes from very far away celestial objects. Draw a ray diagram to show what happens when light from a far away object falls on a convex mirror and a concave mirror. 2

Q.39. Given here is a four carbon skeleton of a hydrocarbon compound.

- (a) Fill in the hydrogen atoms/bonds to form: 2
 (i) a saturated hydrocarbon
 (ii) an unsaturated hydrocarbon



Or

- (a) If the four-carbon skeleton is of a straight chained alkene, draw the structures of all the possible compounds. 2
 (b) If the four-carbon skeleton is of a straight chained alkyne how many carbon atoms may NOT be bonded to any hydrogen atoms? 1
 (c) If the four-carbon skeleton is of a straight chained alkyne how many hydrogen atoms will there be in the compound? 1

2

For Solutions



Sample Question Paper

Time Allowed: 3 hours

Maximum Marks: 80

General Instructions:

1. All questions would be compulsory. However, an internal choice of approximately 33% would be provided. 50% marks are to be allotted to competency-based questions.
2. Section A would have 16 simple/complex MCQs and 04 Assertion-Reasoning type questions carrying 1 mark each.
3. Section B would have 6 Short Answer (SA) type questions carrying 02 marks each.
4. Section C would have 7 Short Answer (SA) type questions carrying 03 marks each.
5. Section D would have 3 Long Answer (LA) type questions carrying 05 marks each.
6. Section E would have 3 source based/case based/passage based/integrated units of assessment (04 marks each) with sub-parts of the values of 1/2/3 marks.

SECTION-A

Questions 1 to 16 are Multiple Choice Questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

Q.1. The yellow colour of turmeric changes to red on addition of soap solution. When substance P is added to turmeric, there is no change in colour.

Which of the following is definitely true about substance P?

1

- (a) P is an acid. (b) P is not a salt.
(c) P is not a base. (d) P is a neutral substance.

Q.2. What happens when a solution of an acid is mixed with a solution of a base in a test tube?

1

- (i) Temperature of the solution decreases
(ii) Temperature of the solution increases
(iii) Temperature of the solution remains the same
(iv) Salt formation takes place

Options:

- (a) (i) and (iv) (b) (i) and (iii) (c) (ii) only (d) (ii) and (iv)

Q.3. During the electrolytic refining of copper what happens at the anode?

1

- (a) copper ions gain electrons to become neutral copper atoms
(b) neutral copper atoms gain electrons to become ions
(c) copper ions lose electrons to become neutral atoms
(d) neutral copper atoms lose electrons to become ions

Q.4. During purification of a metal by electrolysis, what happens at the negative electrode?

1

- (a) Metal ions lose electrons to become neutral atoms.
(b) Neutral metal atoms gain electrons to become ions.
(c) Neutral metal atoms lose electrons to become ions.
(d) Metal ions gain electrons to become neutral metal atoms.

Q.5. C_3H_8 belongs to the homologous series of

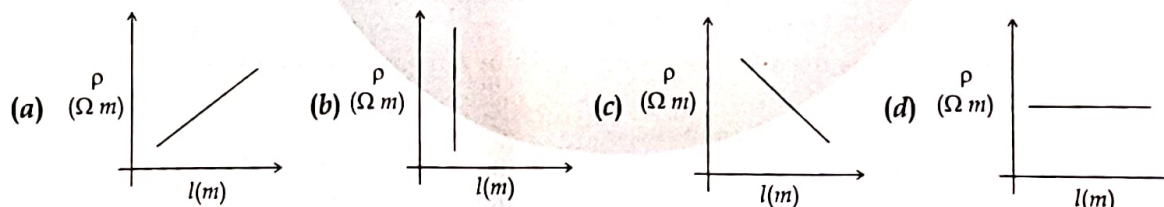
1

- (a) Alkynes (b) Alkenes (c) Alkanes (d) Cyclo alkanes

(viii) ■ PADHLEAKSHAY'S 33 DAYS CHALLENGE [Science-X]



- Q.6. Metal X reacts with Dil. HCl to form Metal Salt and Gas. Identify X? 1
 (a) Copper (b) Mercury (c) Silver (d) Zinc
- Q.7. In which mode of nutrition an organism derives its food from the body of another living organism without killing it. 1
 (a) Saprotrophic nutrition (b) Parasitic nutrition
 (c) Holozoic nutrition (d) Autotrophic nutrition
- Q.8. In human males, the testes lie in the scrotum because it helps in the 1
 (a) maintaining the temperature (b) formation of sperms
 (c) easy transfer of gametes (d) secretion of estrogen
- Q.9. The embryo in humans gets nutrition from the mother's blood with the help of a special tissue called 1
 (a) Placenta (b) Villi (c) Uterus (d) Womb
- Q.10. Mendelian experiment consisted of breeding tall pea plants bearing violet flowers with short pea plants bearing white flowers. In the progeny, all bare violet flowers, but almost half of them were short. This suggests that the genetic makeup of tall plant can be depicted as 1
 (a) TTWW (b) TTww (c) TtWW (d) TYWw
- Q.11. The number of pairs of sex chromosomes in the zygote of a human being is 1
 (a) 2 (b) 3 (c) 1 (d) 4
- Q.12. Consider these indices of refraction: glass: 1.52; air: 1.0003; water: 1.333. Based on the refractive indices of three materials, arrange the speed of light through them in decreasing order. 1
 (a) The speed of light in water > the speed of light in air > the speed of light in glass.
 (b) The speed of light in glass > the speed of light in water > the speed of light in air.
 (c) The speed of light in air > the speed of light in water > the speed of light in glass.
 (d) The speed of light in glass > the speed of light in air > the speed of light in water.
- Q.13. Name the scientist who was the first to use a glass prism to obtain the spectrum of sunlight. 1
 (a) Isaac Newton (b) Einstein (c) Kepler (d) Hans Christian Oersted
- Q.14. Raman wants to draw a graph to show how the resistivity (ρ) of a wire changes with the length (l) of the wire. What should his graph look like? 1



- Q.15. When a 4V battery is connected across an unknown resistor there is a current of 100 mA in the circuit. The value of the resistance of the resistor is: 1
 (a) 401 Ω (b) 40 Ω (c) 400 Ω (d) 0.4 Ω
- Q.16. A magnetic field directed in north direction acts on an electron moving in east direction. The magnetic force on the electron will act 1
 (a) vertically upwards. (b) towards east.
 (c) vertically downwards. (d) towards north.

Quest
ques

17 to 20 consist of two statements—Assertion (A) and Reason (R). Answer these selecting the appropriate option given below:

- (a) Both (A) and (R) are true and (R) is the correct explanation of (A).
 (b) Both (A) and (R) are true and (R) is not the correct explanation of (A).
 (c) (A) is true but (R) is false.
 (d) (A) is false but (R) is true.

- Q.17. Assertion (A): Rusting of Iron is endothermic in nature. 1
Reason (R): As the reaction is slow, the release of heat is barely evident.
- Q.18. Assertion (A): Food cans are coated with tin and not with zinc. 1
Reason (R): Zinc is more reactive than tin.
- Q.19. Assertion (A): Artificial kidney is a device used to remove nitrogenous waste products from the blood through dialysis. 1
Reason (R): Reabsorption does not occur in artificial kidney.
- Q.20. Assertion (A): The height of an object is always considered positive. 1
Reason (R): An object is always placed above the principal axis in the upward direction.

SECTION-B

Question No. 21 to 26 are very short answer questions.

- Q.21. A student dropped a few pieces of marble in dilute hydrochloric acid contained in a test tube. The evolved gas was passed through lime water. What change would be observed in lime water? Write balanced chemical equations for both the changes observed. 2
Or, Identify the acid and base which form sodium hydrogen carbonate. Write chemical equation in support of your answer. State whether this compound is acidic, basic or neutral. Also write its pH value.
- Q.22. Define Amphoteric oxides? Give two examples of such oxides. 2
- Q.23. Explain the term "Regeneration" as used in relation to reproduction of organisms. Describe briefly how regeneration is carried out in multicellular organisms like Hydra. 2
Or, (a) Trace the path a male gamete takes to fertilise a female gamete after being released from the penis.
(b) State the number of sets of chromosomes present in a zygote.
- Q.24. Write three main functions of the nervous system. 2
- Q.25. List four advantages of vegetative propagation. 2
- Q.26. A plant X was enclosed in a glass jar with some lizards. A similar plant Y was enclosed in another glass jar but without lizards. Both the jars are kept under the same light conditions for a few hours. Which plant is likely to photosynthesize more and why? 2

SECTION-C

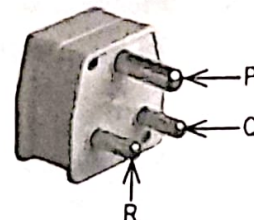
Questions No. 27 to 33 are short answer questions.

- Q.27. The Thermit process is used for repairing cracks in railway tracks on site. 3
(a) Write the equation for the reaction taking place in the process, mentioning the physical states of the reactants and products.
(b) What information in the chemical equation indicates that the reaction is exothermic?
- Q.28. Differentiate between Corrosion and Rancidity with suitable examples. 3
- Q.29. We are advised to take iodised salt in our diet by doctors. Justify its importance in our body. 3
- Q.30. A green stemmed rose plant denoted by GG and a brown stemmed rose plant denoted by gg are allowed to undergo a cross with each other. 3
(a) List your observations regarding
(i) colour of stem in their F_1 progeny.
(ii) percentage of brown stemmed plants in F_2 progeny if F_1 plants are self pollinated.
(iii) ratio of GG and Gg in the F_2 progeny.
(b) Based on the findings of this cross, what conclusion can be drawn?
- Q.31. A student takes a mirror which is depressed at the centre and mounts it on a mirror stand. An erect and enlarged image of his face is formed. He places the mirror on a stand along a metre scale at 10 cm mark. In front of this mirror, he mounts a white screen and moves it back and forth along the metre scale till a highly sharp, well-defined image of a distant building is formed on the screen at 25.5 cm mark. 3

- (i) Name the mirror and find its focal length.
(ii) Why does the student get sharp image of the distant building at 25.5 cm mark?
Or, (a) Draw a ray diagram to show the refraction of light through a glass slab and mark angle of refraction and the lateral shift suffered by the ray of light while passing through the slab.
(b) If the refractive index of glass for light going from air to glass is $\frac{3}{2}$, find the refractive index of air for light going from glass to air. 3
Q.32. What is meant by the far point, near point and the least distance of distinct vision? 3
Q.33. Sunita had to replace the electrical plug of her clothes iron. She bought a three-pin plug as shown here. 3

When she removed the old plug, she saw that there were three wires coloured red, black and green.

- (a) To which pin on the plug should she connect the green wire?
(b) To which part of the clothes iron is the green wire connected?
(c) State the function of the green wire.

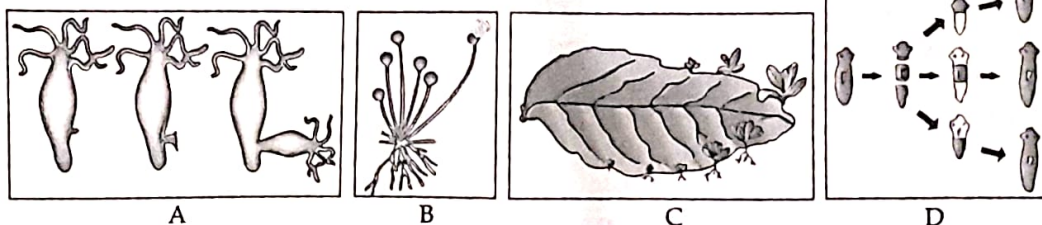


SECTION-D

Questions no. 34 to 36 are Long Answer Questions.

- Q.34. (a) A gas is released during photosynthesis. Name the gas and also state the way by which the gas is evolved. 5
(b) What are stomata? What governs the opening and closing of stomata?
Or, (i) Draw a diagram of human alimentary canal and label the following parts:
(a) largest gland.
(b) gland that secretes digestive enzymes and hormone.
(c) part where HCl is produced.
(d) part where digested food is absorbed.
(e) part which stores bile until it's needed for digestion.
(ii) What are villi? Explain their function in the digestive system.

Q.35.



5

- (i) Identify the organisms in figures A, B, C and D.
(ii) Identify the life process commonly shown in all the figures.
(iii) How is the life process advantageous to the organisms? Mention any *two* advantages.
Or, Name the type of asexual reproduction in which two individuals are formed from a single parent and the parental identity is lost.

- Q.36. (a) Cable of microwave oven has three wires inside which have insulation of different colours black, green, red. Mention the significance of each colour and potential difference between red and black. 5
(b) Design an activity with the help of two nails, very thin aluminium sheet, a 12 V battery and a key to illustrate how fuse works.
Or, (a) What is an electromagnet? List any *two* uses.
(b) Draw a labelled diagram to show how an electromagnet is made.
(c) State the purpose of the soft iron core used in making an electromagnet.

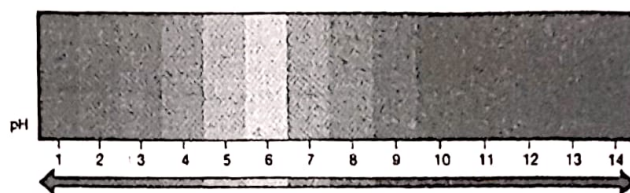
- (d) List *two* ways of increasing the strength of an electromagnet if the material of the electromagnet is fixed.

SECTION-E

Questions No. 37 to 39 are case-based/data-based questions.

4

Q.37. Whenever a solution has a pH of less than 7, it will be an acidic solution. For e.g., a solution having a pH of 4 will be acidic in nature (or it will be an acid). Please note that more acidic a solution is, the lower will be its pH. For example,



a solution of pH 1 is much more acidic than another solution of pH 4. In other words, a solution of pH 1 will be a much more stronger acid than another acid having pH 4 (see the figure).

Now answer the following questions on the basis of reading of this para:

(a) If solution turns red litmus to blue, what could be its pH value. 1

(b) pH value of 5 solutions are given below 1

(A) = pH value 4; (B) pH value 8; (C) pH value 2; (D) pH value 7; (E) pH value 11.

Which of these are basic solutions?

(c) If a beaker having concentrated HCl acid has pH value 1, what will be the colour of universal indicator, when a drop of the acid is poured on this indicator? 2

Or, (c) What is the importance of pH in everyday life? 2

Q.38. You go for a visit to your grandmother's house. You see that she keeps her house beautiful and green with lots of plants. She has many potted plants inside and outside of the house. However she complains that the plants kept in the drawing room are not keeping straight, all the plants were bending towards one direction.



4

On the basis of reading of the above para, write the answers of the following:

(a) Shoots were bending in which direction of that house? 1

(b) Name the plant hormone involved in this phenomenon. 1

(c) Grandma's plants are showing which type of tropic movement? 2

Or, (c) Name *two* other types of tropic movements shown by the plants. 2

Q.39. A mirror is a surface that reflects a clear image. Images can be of two types: Real image and virtual image. An image that can be formed on the screen is known as a real image and the one which cannot be formed on the screen is known as a virtual image. These images are formed when light falls on a mirror from the object and is reflected back by the mirror on the screen. One useful tool that is frequently used to depict this idea is known as a ray diagram. A ray diagram is a diagram that traces the path that light takes in order for a person to view a point on the image of an object. On the diagram, rays (lines with arrows) are drawn for the incident ray and the reflected ray.

A ray diagram uses arrow type lines to represent the incident ray and the reflected ray. It also helps to trace the direction in which light travels. 4

(a) What is Ray diagram? 1

(b) Name *two* types of images formed by the mirrors. 1

(c) What type of image can be taken on a screen? What is the nature of virtual image? 2

Or, (c) Write *two* differences between Real image and virtual image. 2

* * * * *

3

For Solutions



Sample Question Paper



Time Allowed: 3 hours

Maximum Marks: 80

General Instructions:

1. All questions would be compulsory. However, an internal choice of approximately 33% would be provided. 50% marks are to be allotted to competency-based questions.
2. Section A would have 16 simple/complex MCQs and 04 Assertion-Reasoning type questions carrying 1 mark each.
3. Section B would have 6 Short Answer (SA) type questions carrying 02 marks each.
4. Section C would have 7 Short Answer (SA) type questions carrying 03 marks each.
5. Section D would have 3 Long Answer (LA) type questions carrying 05 marks each.
6. Section E would have 3 source based/case based/passage based/integrated units of assessment (04 marks each) with sub-parts of the values of 1/2/3 marks.

SECTION-A

Questions 1 to 16 are Multiple Choice Questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

Q.1. This figure is a warning sign for

- (a) A place under Fire.
- (b) On a container storing an explosive.
- (c) On a container storing concentrated acid or a base.
- (d) On a container storing Petrol or Diesel.



1

Q.2. The mode of nutrition found in fungi is:

- (a) Parasitic nutrition
- (b) Holozoic nutrition
- (c) Autotrophic nutrition
- (d) Saprotrophic nutrition

1

Q.3. The highly reactive metals like Sodium, Potassium, Magnesium, etc. are extracted by the

- (a) electrolysis of their molten chlorides
- (b) electrolysis of their molten oxides
- (c) reduction by aluminum
- (d) reduction by carbon

1

Q.4. $\text{Al}_2\text{O}_3 + 2\text{NaOH} \longrightarrow \dots\dots\dots + \text{H}_2\text{O}$

- (a) $\text{Al}(\text{OH})_3$
- (b) Na_2O
- (c) NaAlO_2
- (d) AlNaO_2

1

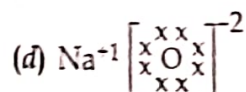
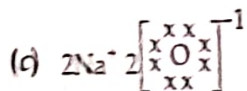
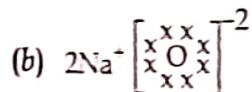
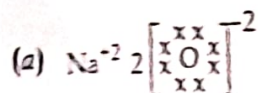
Q.5. The condition produced by aerial oxidation of fats and oils in foods marked by unpleasant smell and taste is called:

- (a) antioxidation
- (b) reduction
- (c) rancidity
- (d) corrosion

1

Q.6. Which one of the following correctly represents Sodium oxide?

1



Q.7. At what temperature is gypsum heated to form Plaster of Paris?

1

(a) 373°C

(b) 100°C

(c) 110°C

(d) 120°C

Q.8. Receptors are usually located in sense organs. Gustatory receptors are present in

1

(a) tongue

(b) nose

(c) eye

(d) ear

Q.9. The image shows the labelled structure of a brain. Which parts of the brain controls the blood pressure?

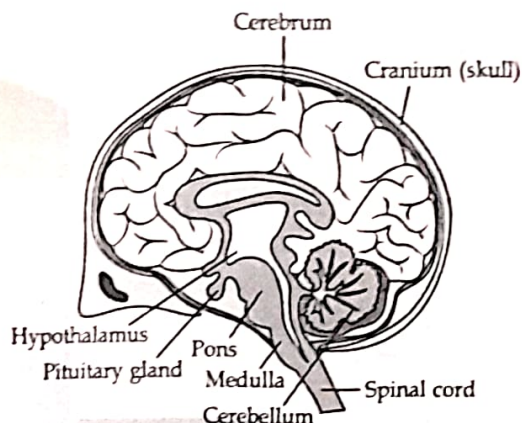
1

(a) Spinal cord, skull, hypothalamus

(b) Cord, skull, cerebrum

(c) Pons, medulla, cerebellum

(d) Pons, medulla, pituitary



Q.10. In Rhizopus, tubular thread-like structures bearing sporangia at their tips are called

1

(a) filaments

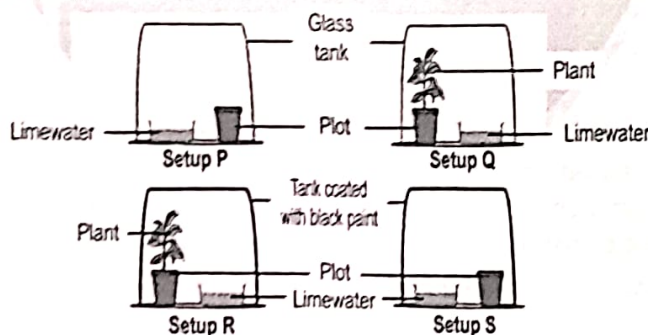
(b) hyphae

(c) rhizoids

(d) roots

Q.11. Lime water turns cloudy in the presence of a gas which is a by-product of respiration. Shown below are four setups kept in sunlight for 24 hours. In which setup lime water is expected to be cloudiest?

1



(a) Setup P

(b) Setup Q

(c) Setup R

(d) Setup S

Q.12. When light enters the atmosphere it strikes on extremely fine particles, which deflect the rays of light in all possible directions. This is due to—

1

(a) reflection of light

(b) atmospheric refraction

(c) scattering of light

(d) dispersion of light

Q.13. The defect of the eye in which the eye-ball becomes too long is

1

(a) myopia

(b) hypermetropia

(c) presbyopia

(d) cataract

- Q.14. When an object was kept at position X in front of a concave mirror, an enlarged and virtual image was formed. 1
Which among the following identifies 'X' correctly?
(a) anywhere between the centre of curvature and principal focus.
(b) anywhere between the pole and principal focus.
(c) exactly at the centre of curvature.
(d) exactly at the principal focus.
- Q.15. The magnetic field is strongest at 1
(a) middle of the magnet (b) north pole
(c) south pole (d) both the poles
- Q.16. Two current carrying conductors are held parallel. The nature of force between them is 1
(a) attractive
(b) repulsive
(c) neither attractive nor repulsive.
(d) attractive or repulsive depending upon the magnitude of the current.
- Question No. 17 to 20 consist of two statements—Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option given below:
- (a) Both (A) and (R) are true and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true and (R) is not the correct explanation of (A).
(c) (A) is true but (R) is false.
(d) (A) is false but (R) is true.
- Q.17. Assertion (A): After white washing the walls, a shiny white finish on walls is obtained after two to three days. 1
Reason (R): Calcium Oxide reacts with Carbon dioxide to form Calcium Hydrogen Carbonate which gives shiny white finish.
- Q.18. Assertion (A): Variations always provide a survival advantage to an organism. 1
Reason (R): Variations can be caused due to incorrect DNA copying.
- Q.19. Assertion (A): Off springs produced by sexual reproduction show variation. 1
Reason (R): Each offspring produced by sexual reproduction inherits all the genes from each parent.
- Q.20. Assertion (A): It is not possible to see a virtual image by eye. 1
Reason (R): The rays that seem to emanate from a virtual image do not in fact emanates from the image.

SECTION-B

Question No. 21 to 26 are very short answer questions.

Q.21. Diana prepared a cake by two methods. Method:

- (i) She added baking soda to the cake mixture and let the mixture stand for one hour before placing it in the oven to bake.
- (ii) She added baking powder to the cake mixture and let the mixture stand for one hour before placing it in the oven to bake.

State the difference in the cake mixtures that Diana is likely to have observed before baking. Explain why. 2

Or

Compare the stability of a neutral sodium atom and a positive sodium ion. Justify your answer.

- Q.22. How do control and coordination in plants differ from that in animals? Give any FOUR points of difference. 2
- Q.23. An object is placed at a distance of 30 cm in front of a convex mirror of focal length 15 cm. Write four characteristics of the image formed by the mirror. 2
- Or
- What is meant by power of a lens? What does its sign (+ve or -ve) indicate? State its S.I. unit. How is this unit related to focal length of a lens? 2
- Q.24. Write any *two* differences between binary fission and multiple fission in a tabular form as observed in cells of organisms. 2
- Q.25. Why did Mendel choose pea plant for studying inheritance? 2
- Q.26. Why is it necessary to conserve our environment? 2

SECTION-C

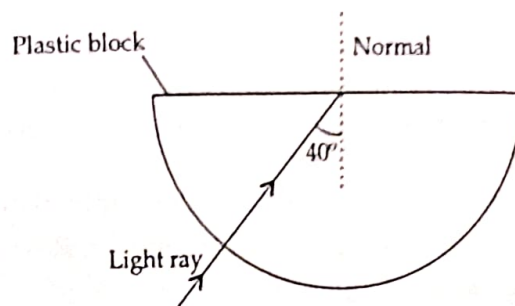
Questions No. 27 to 33 are short answer questions.

- Q.27. (a) Explain the formation of Calcium Chloride with the help of electron dot structure. (At numbers: Ca = 20; Cl = 17) 3
- (b) Why do ionic compounds not conduct electricity in solid state but conduct electricity in molten and aqueous state? 3
- Q.28. (a) Differentiate between alkanes and alkenes. 3
- (b) Alkanes generally burn with clean flame. Why? 3
- Q.29. How is oxygen and carbon dioxide transported in human beings? 3
- Q.30. Draw a labelled diagram of human heart. 3
- Q.31. What happens when a narrow beam of (i) a monochromatic light, and (ii) white light passes through (a) glass slab and (b) glass prism? 3
- Or
- (a) Water has refractive index 1.33 and alcohol has refractive index 1.36. Which of the two mediums is optically denser? Give reason for your answer. 2
- (b) Draw a ray diagram to show the path of a ray of light passing obliquely from water to alcohol. 1
- Q.32. (a) Write Joule's law of heating. 3
- (b) Two lamps, one rated 100 W; 220 V, and the other 60 W; 220 V, are connected in parallel to electric mains supply. Find the current drawn by two bulbs from the line, if the supply voltage is 220 V. 3
- Q.33. List any *four* disadvantages of using fossil fuels for the production of energy. 3

SECTION-D

Questions no. 34 to 36 are Long Answer Questions.

- Q.34. What eye defect is hypermetropia? Describe with a ray diagram how this defect of vision can be corrected by using an appropriate lens. 5
- Or
- (i) Explain why the refractive index of any material with respect to air is always greater 1. 2
- (ii) In the figure below a light ray travels from air into the semi-circular plastic block. Give a reason why the ray does not deviate at the semi-circular boundary of the plastic block. 2



(iii) Complete the ray diagram of the above scenario when the light ray comes out of the plastic block from the top flat end. 1

Q.35. Match the following pH values 1, 7, 10, 13 to the solutions given below: 5

- Milk of magnesia
- Gastric juices
- Brine
- Aqueous Sodium hydroxide.

Amit and Rita decided to bake a cake and added baking soda to the cake batter. Explain with a balanced reaction, the role of the baking soda. Mention any other use of baking soda.

Or

(i) Four samples A, B, C and D change the colour of pH paper or solution to Green, Reddish-pink, Blue and Orange. Their pH was recorded as 7, 2, 10.5 & 6 respectively. Which of the samples have the highest amount of Hydrogen ion concentration? Arrange the four samples in the decreasing order of their pH. 2

(ii) Rahul found that the Plaster of Paris, which he stored in a container, has become very hard and lost its binding nature. What is the reason for this? Also, write a chemical equation to represent the reaction taking place. 2

(iii) Give any one use of Plaster of Paris other than for plastering or smoothening of walls. 1

Q.36. Differentiate between addition reaction and substitution reaction. Give one example of each. 5

Or, List in tabular form three physical and two chemical properties on the basis of which ethanol and ethanoic acid can be differentiated.

SECTION-E

Questions No. 37 to 39 are case-based/data-based questions.

Q.37. Chemical reaction, a process in which one or more substances, the reactants, are converted to one or more different substances, the products. Substances are either chemical elements or compounds. A chemical reaction rearranges the constituent atoms of the reactants to create different substances as products.

Study this table which is related to the different types of reactions/processes and answer the questions that follow: 4

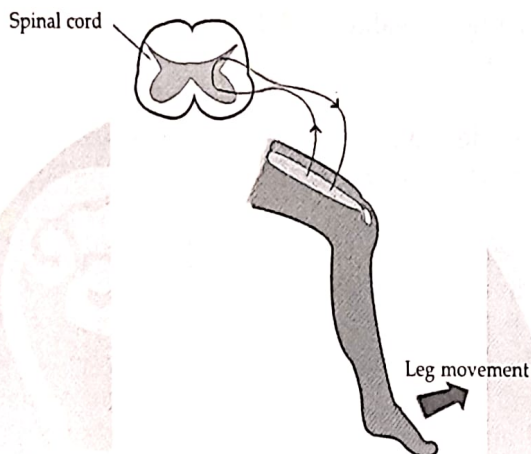
Name of Process	Word Equation
Combustion	Magnesium + Oxygen $\xrightarrow{\text{heat}}$ Magnesium dioxide
Photosynthesis	Carbon dioxide + Water $\xrightarrow[\text{chlorophyll}]{\text{sunlight}}$ Glucose + Oxygen + Water
Combination	Iron + Sulphur $\xrightarrow{\text{heat}}$ Iron sulphide
Photodecomposition	Silver Bromide $\xrightarrow{\text{light}}$ Silver + Bromine

Sample Question Paper-03 ■ (xvii)

- (a) What is the role of light in the reaction: Silver bromide $\xrightarrow{\text{light}}$ Silver + Bromine 1
 (b) What type of reaction is combustion reaction given in this table. 1
 (c) Whether Photosynthesis is exothermic or endothermic? Give one example of endothermic reaction given in this table. 2

Or, (c) What are exothermic reactions? Give one example also. 2

- Q.38. Both of Amit and Ravi were playing football. Suddenly, Ravi gets tired and sits on a high bench and therefore his leg does not touch the ground. Amit gently hits below his knee cap with result Ravi's leg immediately kicked outwards. Amit found it funny but Ravi told Amit about the some scientific reason for it. He explained the concept to Ravi but not in the correct order.

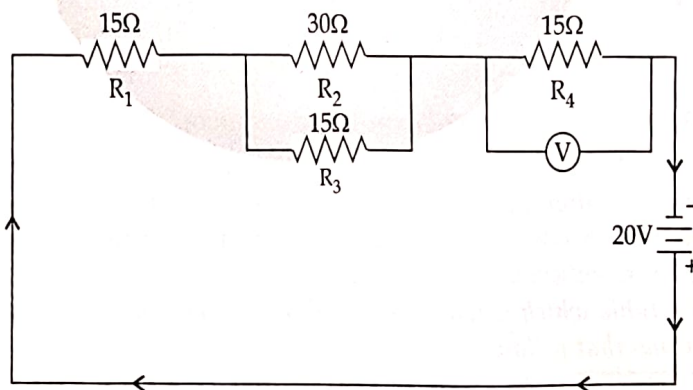


On the basis of reading of this para, answer the following questions: 4

- (a) Write the name of concept which Ravi is talking about. 1
 (b) Name the part of the Nervous system which Controls the movement of knee. 1
 (c) Give two other examples of the above mentioned concept. 2

Or, (c) Prepare a flow chart of the above mentioned concept. 2

- Q.39. Four resistors, a voltmeter and a battery are connected in a circuit as shown below. 4



- (a) What is the net resistance in the circuit? 1
 (b) How much potential difference will the voltmeter connected across the resistor R_4 measure? 1
 (c) What is the power dissipated by the resistor R_1 ? 2
 Or, (c) If R_3 is removed, will the net current in the circuit increase or decrease or remain the same? Justify your answer. 2

4

Sample Question Paper

For Solutions



Time Allowed: 3 hours

Maximum Marks: 80

General Instructions:

1. All questions would be compulsory. However, an internal choice of approximately 33% would be provided. 50% marks are to be allotted to competency-based questions.
2. Section A would have 16 simple/complex MCQs and 04 Assertion-Reasoning type questions carrying 1 mark each.
3. Section B would have 6 Short Answer (SA) type questions carrying 02 marks each.
4. Section C would have 7 Short Answer (SA) type questions carrying 03 marks each.
5. Section D would have 3 Long Answer (LA) type questions carrying 05 marks each.
6. Section E would have 3 source based/case based/passage based/integrated units of assessment (04 marks each) with sub-parts of the values of 1/2/3 marks.

SECTION-A

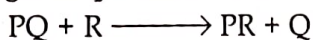
Questions 1 to 16 are Multiple Choice Questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

Q.1. Galvanisation is a process of coating iron articles with a layer of zinc to prevent the iron from rusting. The iron is protected even if the zinc coating is scratched and iron is exposed. 1

Which of the following is true about how zinc prevents the rusting of iron?

- (P) A galvanised iron article does not undergo oxidation.
 (Q) The zinc coating prevents contact of iron with air.
 (R) Zinc undergoes corrosion more easily than iron.
 (a) only (P) (b) only (Q)
 (c) only (P) and (Q) (d) only (Q) and (R)

Q.2. A single displacement reaction is represented below. 1



Which of the following is true about the reactants and products?

Option	Nature of R in product	Stability of PR as compared to PQ
A	cation	more stable
B	cation	less stable
C	anion	more stable
D	anion	less stable

- (a) A (b) B (c) C (d) D

Q.3. Which of the following is the correct arrangement of the given metals in descending order of their reactivity? 1

Zinc, Iron, Magnesium and Sodium

- (a) Zinc > Iron > Magnesium > Sodium (b) Sodium > Magnesium > Iron > Zinc
(c) Sodium > Zinc > Magnesium > Iron (d) Sodium > Magnesium > Zinc > Iron

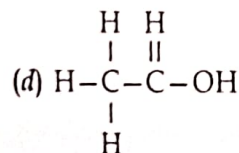
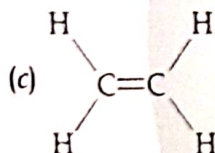
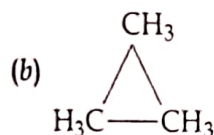
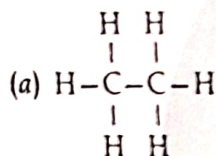
Q.4. What is a likely limitation of electric impulses? 1

- (a) The electric impulses travel slowly between the neurons.
(b) The electric impulses allow signal transmission in multiple directions.
(c) The electric impulses are transmitted to only those body parts that are connected to neurons.
(d) The electric impulses once generated needs to be transmitted quickly within the body.

Q.5. An aqueous solution turns red litmus solution blue. Excess addition of which of the following solution would reverse the change? 1

- (a) Baking powder (b) Lime
(c) Ammonium hydroxide solution (d) Hydrochloric acid

Q.6. Which of these compounds can be classified as an unsaturated compound? 1



Q.7. The procedure used for cleaning the blood of a person by separating urea from it is called: 1

- (a) osmosis (b) filtration (c) dialysis (d) double circulation

Q.8. Tomato is a natural source of which acid? 1

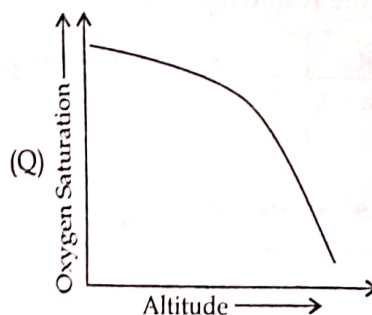
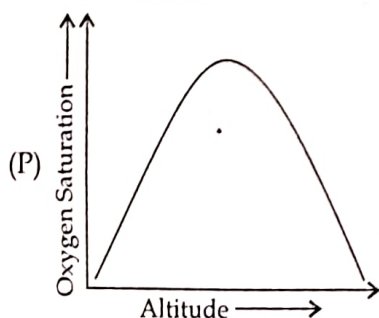
- (a) Acetic acid (b) Citric acid (c) Tartaric acid (d) Oxalic acid

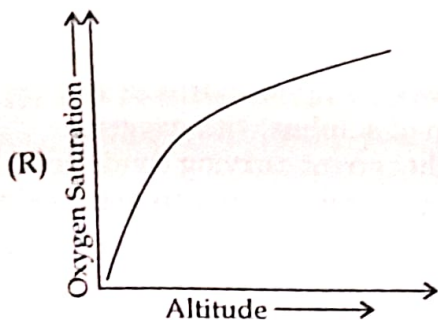
Q.9. The embryo in humans gets nutrition from the mother's blood with the help of a special tissue called 1

- (a) Placenta (b) Villi (c) Uterus (d) Womb

Q.10. Oxygen saturation levels refer to the extent haemoglobin is bound to oxygen. As altitude increases, the atmospheric pressure decreases. 1

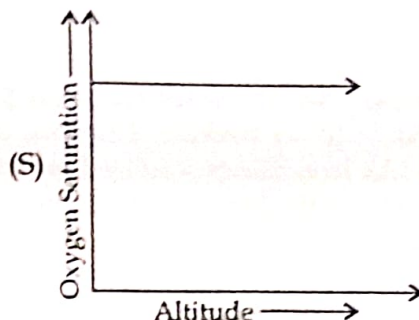
Which of the following graphs correctly represents the oxygen saturation levels as altitude increases?





(a) (P)

(b) (Q)



(c) (R)

(d) (S)

Q.11. Pure-bred pea plant A is crossed with pure-bred pea plant B. It is found that the plants which look like A do not appear in F₁ generation but re-emerge in F₂ generation. Which of the plants A and B are tall and dwarf? 1

- (a) A are tall and B are dwarf.
- (b) A are tall and B are also tall.
- (c) A are dwarf and B are also dwarf.
- (d) A are dwarf and B are tall

Q.12. When an object was kept at position X in front of a concave mirror, an enlarged and virtual image was formed. Which among the following identifies 'X' correctly? 1

- (a) anywhere between the centre of curvature and principal focus.
- (b) anywhere between the pole and principal focus.
- (c) exactly at the centre of curvature.
- (d) exactly at the principal focus.

Q.13. Acid rain is caused by the oxides of 1

- (a) carbon
- (b) nitrogen only
- (c) sulphur only
- (d) sulphur and nitrogen

Q.14. The frequency of AC in some countries is 60 Hz. What does this mean? 1

- (a) The current changes direction 60 times in a second.
- (b) The current changes direction 120 times in a second.
- (c) The current changes direction after every 60 seconds.
- (d) The current changes direction after every 120 seconds.

Q.15. On placing a copper coin in a test tube containing green ferrous sulphate solution, it will be observed that the ferrous sulphate solution 1

- (a) turns blue, and a grey substance is deposited on the copper coin.
- (b) turns colourless and a grey substance is deposited on the copper coin.
- (c) turns colourless and a reddish-brown substance is deposited on the copper coin.
- (d) remains green with no change in the copper coin.

Q.16. The sky appears dark to passengers flying at very high altitudes mainly because: 1

- (a) Scattering of light is not enough at such heights.
- (b) There is no atmosphere at great heights.
- (c) The size of molecules is smaller than the wavelength of visible light.
- (d) The light gets scattered towards the earth.

Question No. 17 to 20 consist of two statements – Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option given below:

- (a) Both (A) and R are true, and (R) is the correct explanation of (A).
- (b) Both (A) and R are true, and (R) is not the correct explanation of (A).

- (i) (A) is true but (R) is false.
 (ii) (A) is false but (R) is true.
- Q.17. Assertion (A): Pungent smelling gas is produced when sulphur burns in air.
 Reason (R): Sulphur trioxide is formed on reaction of sulphur with oxygen. 1
- Q.18. Assertion (A): Iron filings scattered around a straight current carrying conductor in a plane perpendicular to the length of the conductor, arrange themselves in concentric circles.
 Reason (R): Magnetic field has both magnitude and direction. 1
- Q.19. Assertion (A): Omnivores receive 10% of their energy from the trophic level below them.
 Reason (R): An omnivore is always in the trophic level just above herbivores. 1
- Q.20. Assertion (A): Higher is the refractive index of a medium or denser the medium, lesser the velocity of light in that medium.
 Reason (R): Refractive index is inversely proportional to velocity. 1

SECTION-B

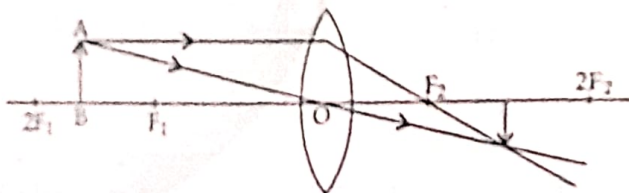
Question No. 21 to 26 are very short answer questions.

- Q.21. "Dil. HCl is added to Zn granules." How will you prove that chemical change has taken place here? Support your response with two arguments. 2
- Or, Keerti added dilute Hydrochloric acid to four metals and recorded her observations as shown in the table given below:

Metal	Gas Evolved
Copper	Yes
Iron	Yes
Magnesium	No
Zinc	Yes

Select the correct observation(s) and give chemical equation(s) of the reaction involved.

- Q.22. Study the given ray diagram and list two mistakes committed by the student while tracing it. Rectify these mistakes by drawing the correct ray diagram to show the real position and size of the image corresponding to the position of the object AB. 2



- Or, To construct a ray diagram, we use two light rays which are so chosen that it is easy to know their directions after refraction from the convex lens. List these two rays and state the path of these rays after refraction. 2
- Q.23. Why is chemical communication better than electrical impulses as a means of communication between cells in a multi-cellular organism? 2
- Q.24. State the post-fertilisation changes that lead to fruit formation in plants. 2
- Q.25. Bile juice does not contain any enzyme but bile salts are important for digestion and absorption of fats. State reason. 2
- Q.26. Study the food chain given below and answer the questions that follow: 2



- (a) If the amount of energy available at the third trophic level is 100 joules, then how much energy will be available at the producer level? Justify your answer.
 (b) Is it possible to have two more trophic levels in this food chain just before the fourth trophic level? Justify your answer.

SECTION-C

Questions No. 27 to 33 are short answer questions.

- Q27. How is washing soda prepared from sodium carbonate? Give its chemical equation. State the type of this salt. Name the type of hardness of water which can be removed by it? 3
 Or, List the important products of the Chlor-alkali process. Write one important use of each.
 Q28. 3 mL of ethanol is taken in a test tube and warmed gently in a water bath. A 5% solution of alkaline potassium permanganate is added first drop by drop to this solution, then in excess. 3
 (i) How is 5% solution of KMnO_4 prepared?
 (ii) State the role of alkaline potassium permanganate in this reaction. What happens on adding it in excess?
 (iii) Write chemical equation of this reaction.

- Q29. The values of current (I) flowing through a given resistor of resistance (R), for the values of potential difference (V) across the resistor are as given below: 3

V (volts)	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0
I (amperes)	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1.0

Plot a graph between current (I) and potential difference (V) and determine the resistance (R) of the resistor.

- Q30. (a) What is translocation? Why is it essential for plants?
 (b) Where are the substances translocated by the phloem delivered? 3
 Q31. The rate of breathing in aquatic organisms is much faster than that seen in terrestrial organisms. Give reason. State the pathway of air from nostrils to the lungs in human beings. 3
 Q32. A student fixes a white sheet of paper on a drawing board. He places a bar magnet in the centre and sprinkles some iron filings uniformly around the bar magnet. Then he taps gently and observes that iron filings arrange themselves in a certain pattern. 3
 (a) Why do iron filings arrange themselves in a particular pattern?
 (b) Which physical property is indicated by the pattern of field lines around the bar magnet?
 (c) State any two properties of magnetic field lines.
 Q33. In a food chain, if 10,000 joules of energy is available to the producer, how much energy will be available to the secondary consumer to transfer it to the tertiary consumer? 3

SECTION-D

Questions no. 34 to 36 are Long Answer Questions.

- Q34. Carbon cannot reduce the oxides of sodium, magnesium and aluminium to their respective metals. Why? Where are these metals placed in the reactivity series? How are these metals obtained from their ores? Take an example to explain the process of extraction along with chemical equations. 5
 Or, An organic compound 'X' on heating with conc. H_2SO_4 forms a compound 'Y' which on addition of one molecule of hydrogen in the presence of nickel forms a compound 'Z'.

One molecule of compound 'Z' on combustion forms two molecules of CO_2 and three molecules of H_2O . Identify giving reasons the compounds 'X', 'Y' and 'Z'. Write the chemical equations for all the chemical reactions involved. 5

Q.35. Given below are certain situations. Analyze and describe its possible impact on a person:

- (a) Testes of a male boy are not able to descend into scrotum during his embryonic development. 1
- (b) Vas deferens of a man is plugged. 1
- (c) Prostate and seminal vesicles are not functional. 1
- (d) Egg is not fertilised in a human female. 1
- (e) Placenta does not attach to the uterus optimally. 1

Or, (a) A doctor has advised Sameer to reduce sugar intake in his diet and do regular exercise after checking his blood test reports. Which disease do you think Sameer is suffering from? Name the hormone responsible for this disease and the organ producing the hormone. 3

(b) Which hormone is present in the areas of rapid cell division in a plant and which hormone inhibits the growth? 2

Q.36. (a) To construct a ray diagram we use two light rays which are so chosen that it is easy to know their directions after reflection from the mirror. List these two rays and state the path of these rays after reflection. Use these two rays to locate the image of an object placed between infinity and the centre of curvature of a concave mirror. 5

Or, (b) Draw a ray diagram to show the formation of image of an object placed between the pole and principal focus of a concave mirror. How will the nature and size of the image formed change, if the mirror is replaced by a converging lens of same focal length? 5

SECTION-E

Questions No. 37 to 39 are case-based/data-based questions.

Q.37. The table given below shows the hints given by the quiz master in a quiz. 4

S. No.	HINT
1.	Substance 'C' is used as a preservative.
2.	'C' has two carbon atoms; 'C' is obtained by the reaction of 'A' in presence of alkaline Potassium permanganate followed by acidification.
3.	Misuse of 'A' in industries is prevented by adding Methanol, Benzene and Pyridine to 'A'.
4.	'F' is formed on heating 'A' in presence of Conc. Sulphuric acid.
5.	'F' reacts with Hydrogen gas in presence of Nickel and Palladium catalyst.

Based on the above hints answer the following question:

- (a) Give the IUPAC name of A. 1
- (b) Give the IUPAC name of F. 1
- (c) Illustrate with the help of chemical equations the changes taking place. 2

($\text{A} \rightarrow \text{C}$ and $\text{A} \rightarrow \text{F}$)

Or, (c) Name the chemical reactions which occur in steps 2 and 5. Identify the compounds formed in these steps if 'A' is replaced with its next homologue. 2

Q.38. Figures (a) to (d) given below represent the type of ear lobes present in a family consisting of 2 children – Rahul, Nisha and their parents. 4



(a) Rahul's Father (b) Rahul (c) Rahul's Mother (d) Rahul's sister Nisha



(e) (f)

Type of ear lobes

Excited by his observation of different types of ear lobes present in his family, Rahul conducted a survey of the type of ear lobes found [Figure (e) and (f)] in his classmates. He found two types of ear lobes in his classmates as per the frequency given below:

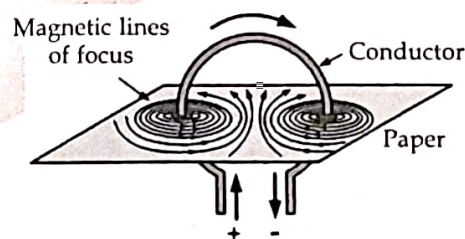
Sex	Free	Attached
Male	36	14
Female	31	19

On the basis of above data answer the following questions:

- Which of the two characteristics—'free ear lobe' or 'attached ear lobe' appears to be dominant in this case? Why? 1
- Is the inheritance of the free ear lobe linked with sex of the individual? Give reason for your answer. 1
- What type of ear lobe is present in father, mother, Rahul and his sister Nisha? Write the genetic constitution of each of these family members which explains the inheritance of this character in this family? 2
(Gene for Free ear lobe is represented by F and gene for attached ear lobe is represented by f for writing the genetic constitution).

Or, (c) Suresh's parents have attached ear lobes. What type of ear lobe can be seen in Suresh and his sister Siya? Explain by giving the genetic composition of all. 2

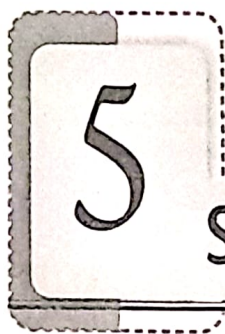
- Q.39. When a current is passed through the circular loop of a wire, magnetic field lines near the coil are nearly circular and concentric. At the centre of the circular loop, the magnetic field lines are straight. The strength of the magnetic field produced by a current-carrying circular coil (or circular wire) depends on— (i) current flowing through the coil, (ii) radius of the circular coil, (iii) number of turns of wire in the circular coil. The direction of the field lines can be found by applying right-hand thumb rule.



Now on the basis of reading of this para, answer the following questions: 4

- What type of Magnetic field lines are produced in a current carrying circular loop? 1
- Where is the magnetic field strength maximum in a current carrying circular loop? 1
- Name the rule which determines the direction of magnetic field lines in such a circular loop. Also state it. 2

Or, (c) Name two factors on which strength of magnetic field of circular loop depends. 2



Sample Question Paper

Time Allowed: 3 hours

Maximum Marks: 80

General Instructions:

1. All questions would be compulsory. However, an internal choice of approximately 33% would be provided. 50% marks are to be allotted to competency-based questions.
2. Section A would have 16 simple/complex MCQs and 04 Assertion-Reasoning type questions carrying 1 mark each.
3. Section B would have 6 Short Answer (SA) type questions carrying 02 marks each.
4. Section C would have 7 Short Answer (SA) type questions carrying 03 marks each.
5. Section D would have 3 Long Answer (LA) type questions carrying 05 marks each.
6. Section E would have 3 source based/case based/passage based/integrated units of assessment (04 marks each) with sub-parts of the values of 1/2/3 marks.

SECTION-A

Questions 1 to 16 are Multiple Choice Questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

Q.1. Baking soda is a mixture of:

1

- (a) Sodium carbonate and acetic acid
- (b) Sodium carbonate and tartaric acid
- (c) Sodium hydrogen carbonate and tartaric acid
- (d) Sodium hydrogen carbonate and acetic acid

Q.2. Neetu has two test tubes containing dilute hydrochloric acid and dilute sodium hydroxide solution, but they are not labelled.

1

Adding which of the following solutions to the test tubes will help her to identify the acidic and basic solution?

- vinegar
- baking soda
- sodium chloride

- (a) vinegar
- (c) sodium chloride

- (b) baking soda
- (d) none of them

Q.3. The contraction and expansion movement of the walls of the food pipe is called:

1

- (a) translocation
- (c) peristaltic movement

- (b) transpiration
- (d) digestion

Q.4. Copper objects lose their shine and form green coating of

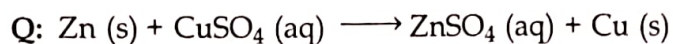
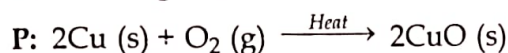
1

- (a) Copper oxide
- (c) Basic Copper carbonate

- (b) Copper hydroxide and Copper oxide
- (d) Copper carbonate

Q.5. The following reactions are carried out in open vessels.

1



Which of the following correctly shows if the weight of the reaction vessel and contents increases, decreases or remains the same after the reaction as compared to before the reaction?

Option	Reaction P	Reaction Q	Reaction R
A	decreases	remains the same	increases
B	remains the same	increases	decreases
C	increases	decreases	increases
D	increases	remains the same	decreases

(a) A

(b) B

(c) C

(d) D

Q.6. Why does carbon form compounds mainly by covalent bonding?

1

(a) There are four electrons in the outermost shell of carbon.

(b) It requires large amount of energy to form C^{4+} or C^{4-} .

(c) It shares its valence electrons to complete its octet.

(d) All the above

Q.7. Glycolysis process occurs in which part of the cell?

1

(a) Cytoplasm

(b) Nucleus

(c) Mitochondria

(d) Chloroplast

Q.8. Nettle sting is a natural source of which acid?

1

(a) Methanoic acid

(b) Lactic acid

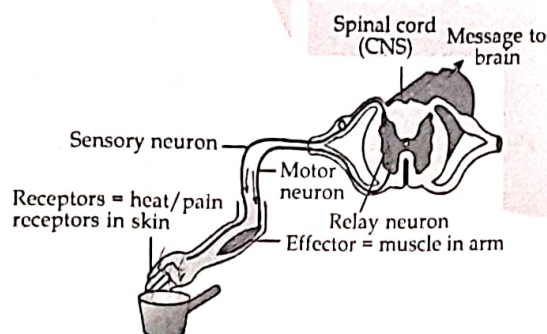
(c) Citric acid

(d) Tartaric acid

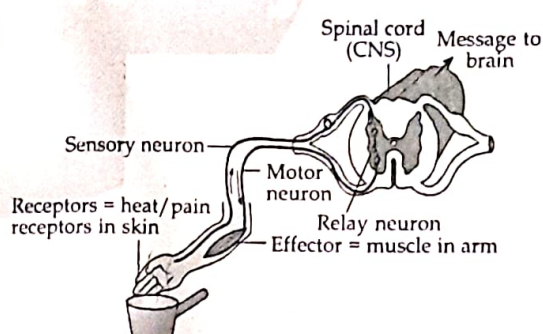
Q.9. Which option correctly shows the sequence of events that occur when we touch a hot utensil?

1

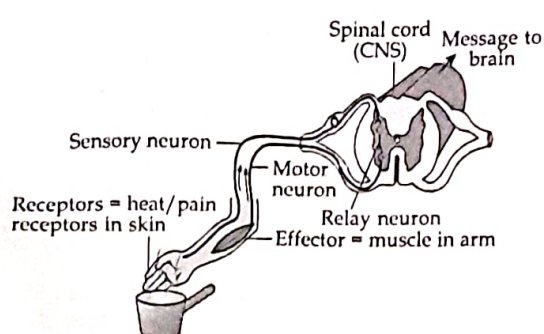
(a)



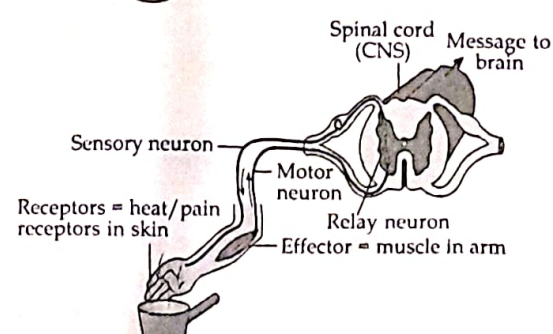
(b)



(c)

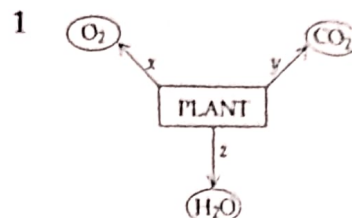


(d)



Q.10. Look at the diagram carefully.
Identify the process taking place at Z.

- (a) Reproduction
- (b) Transpiration
- (c) Photosynthesis
- (d) Translocation

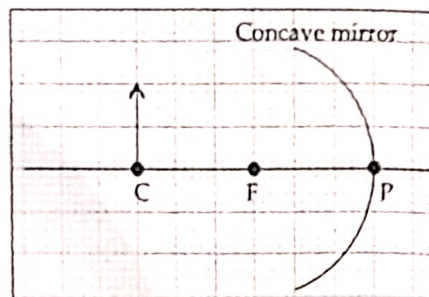


Q.11. Which of the following statement is TRUE about the uptake of water in plants? 1

- (a) It occurs all the time due to diffusion.
- (b) Water enters the roots due to osmosis.
- (c) At night when transpiration is low, roots do not take up water.
- (d) The movement of water from roots to leaves is bidirectional.

Q.12. Examine the adjoining figure and state which of the following option is correct? [one small box in the figure is equal to 1 cm]. 1

- (a) The mirror has a focal length of -6 cm & will produce an image of magnification +1.
- (b) The mirror has a focal length of -3 cm & will produce an image of magnification -1.
- (c) The mirror has a focal length of -3 cm & will produce an image of magnification +1.
- (d) The mirror has a focal length of -6 cm and will produce an image of magnification -1.



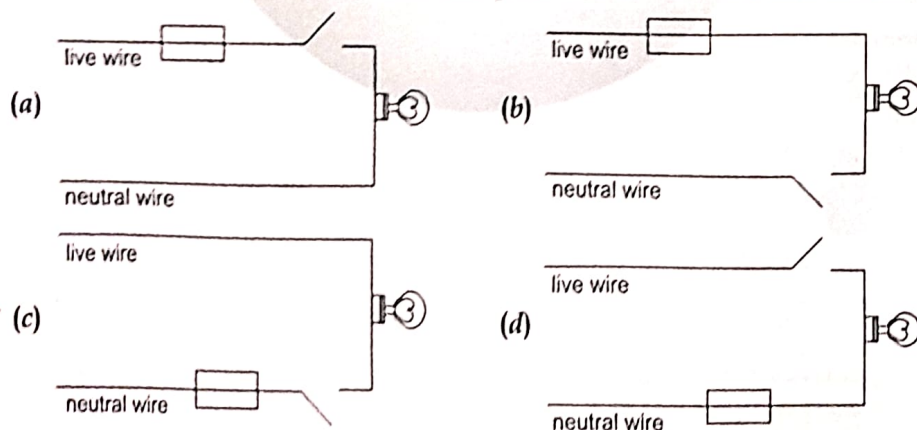
Q.13. An object is placed in front of a convex mirror. Its image is formed: 1

- (a) at a distance equal to the object distance in front of the mirror.
- (b) at twice the distance of the object in front of the mirror.
- (c) half the distance of the object in front of the mirror.
- (d) behind the mirror and its position varies according to the object distance.

Q.14. 1 kWh = J

- (a) 3.6×10^{-6} J
- (b) $\frac{1}{3.6} \times 10^6$ J
- (c) 3.6×10^6 J
- (d) $\frac{1}{3.6} \times 10^{-6}$ J

Q.15. Which circuit shows the correct and safe positions for the fuse and the switch? 1



Q.16. Magnetic lines of force inside current carrying solenoid are 1

- (a) perpendicular to axis.
- (b) along the axis and are parallel to each other.
- (c) parallel inside the solenoid and circular at the ends.
- (d) circular.

Question No. 17 to 20 consist of two statements—Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option given below:

- (a) Both (A) and R are true, and (R) is the correct explanation of (A).
- (b) Both (A) and R are true, and (R) is not the correct explanation of (A).
- (c) (A) is true but (R) is false.
- (d) (A) is false but (R) is true.

Q.17. Assertion (A): In the metallurgy of Al, purified Al_2O_3 is mixed with Na_3AlF_6 or CaF_2 . 1
Reason (R): It lowers the melting point of the mixture and brings conductivity.

Q.18. Assertion (A): To dilute concentrated sulphuric acid, water is added to the acid slowly. 1
Reason (R): A lot of heat energy will be given out in the dilution of concentrated sulphuric acid.

Q.19. Assertion (A): Energy is used during the process of respiration. 1
Reason (R): Respiration stores energy in the form of ATP.

Q.20. Assertion (A): On freely suspending a current-carrying solenoid, it comes to rest in Geographical N-S direction. 1
Reason (R): One end of current carrying straight solenoid behaves as a North pole and the other end as a South pole, just like a bar magnet.

SECTION-B

Question No. 21 to 26 are very short answer questions.

Q.21. Identify the type of reaction from the following equations: 2

- (i) $\text{CH}_4 + 2\text{O}_2 \longrightarrow \text{CO}_2 + 2\text{H}_2\text{O}$
- (ii) $\text{Pb}(\text{NO}_3)_2 + 2\text{KI} \longrightarrow \text{PbI}_2 + 2\text{KNO}_3$
- (iii) $\text{CaO} + \text{H}_2\text{O} \longrightarrow \text{Ca}(\text{OH})_2$
- (iv) $\text{CuSO}_4 + \text{Zn} \longrightarrow \text{ZnSO}_4 + \text{Cu}$

Or, While studying the decomposition reaction by heating ferrous sulphate crystals in a test-tube, a product is formed in the test-tube. Name the product and write its colour.

Q.22. Write the function of the following in the human alimentary canal: 2

- (i) Saliva (ii) HCl in stomach (iii) Bile juice (iv) Villi

Q.23. In the experimental set up to show that " CO_2 is given out during respiration", name the substance taken in the small test tube kept in the conical flask. State its function and the consequences of its use. 2

Q.24. State the difference between Leishmania and Paramecium on the basis of Reproduction in them. 2

- Or,
- (a) How do organisms reproduced by fission?
 - (b) Write names of any two organisms which reproduce by this method.
 - (c) Differentiate between the fission of Leishmania and Plasmodium.

Q.25. The refractive indices of three media are given below: 2

Medium	Refractive Index
A	1.6
B	1.8
C	1.5

A ray of light is travelling from A to B and another ray is travelling from B to C.

- (a) In which of the two cases the refracted ray bends towards the normal?

- (b) In which case does the speed of light increase in the second medium? Give reasons for your answer.

Q.26. Why is excessive use of CFCs a cause of concern? 2

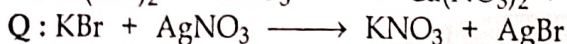
SECTION-C

Questions No. 27 to 33 are short answer questions.

Q.27. State reason for the following: 3

- (i) dry HCl gas does not change the colour of the dry blue litmus paper.
- (ii) alcohol and glucose also contain hydrogen, but do not conduct electricity.
- (iii) Conc. of H_3O^+ ion is affected when a solution of an acid is diluted.

Q.28. Observe the two chemical equations given below: 3



- (a) Explain how a balanced equation can be identified.
- (b) Which of the two equations is/are NOT balanced? Balance the equation(s) by rewriting.

Q.29. What is rainbow? When and where do we see a rainbow? How is a rainbow formed? 3
Draw a labelled diagram to illustrate the formation of a rainbow.

- Q.30. (a) If the image formed by a mirror for all position of the object placed in front of it is always diminished, erect and virtual, state the type of the mirror and also draw a ray diagram to justify your answer. Write one use such mirrors are put to and why. 3
(b) Define the radius of curvature of spherical mirrors. Find the focal length of a spherical mirror whose radius of curvature is +24 cm.

Q.31. "A concave mirror of focal length ' f ' can form a magnified erect as well as an inverted image of an object placed in front of it." Justify this statement stating the position of the object with respect to the mirror in each case for obtaining these images. 3

Q.32. (a) Compare the length of small intestine in a herbivore and a carnivore animal. 3
(b) Mention any two structural modifications in small intestine which helps in absorption.

Or, (a) Write the correct sequence of steps followed during journey of oxygen rich blood from lungs to various organs of human body.

(b) What happens when the system of blood vessels develops a leak?

Q.33. Why is damage to the ozone layer a cause for concern? What are its causes and what steps are being taken to limit this damage? 3

SECTION-D

Questions no. 34 to 36 are Long Answer Questions.

Q.34. (a) Show the formation of magnesium chloride and sodium chloride by transfer of electrons. 5

(b) Identify the ions present in these compounds.

(c) Why do ionic compounds not conduct electricity in the solid state?

Or, What are covalent compounds? Why are they different from ionic compounds? List their three characteristic properties.

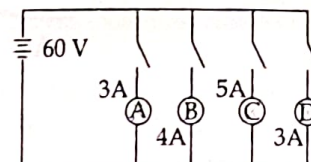
- Q.35. (a) Variation in DNA is beneficial for the survival of species over time. Explain.
(b) Explain an instance where reproduction would be counterproductive to the sustenance of species.

- (c) What is the sequence of events that take place in human reproduction when an egg is not fertilised? 5

- Or, (a) Describe the process of seed formation in a flowering plant.
 (b) Suggest any *two* reasons why child marriages are a hazard to the reproductive health of women.
 (c) Give any *three* advantages of using a mechanical barrier over other contraceptive measures to avoid pregnancy.

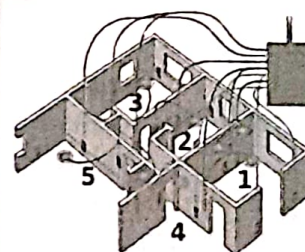
Q.36. In the given circuit, A, B, C and D are four lamps connected with a battery of 60V. Analyse the circuit to answer the following questions. 5

- (i) What kind of combination are the lamps arranged?
 (ii) Explain with reference to your above answer, what are the advantages (*any two*) of this combination of lamps?
 (iii) Explain with proper calculations which lamp glows the brightest?
 (iv) Find out the total resistance of the circuit.



Or, The diagram above is a schematic diagram of a household circuit. The house shown in the above diagram has 5 usable spaces where electrical connections are made. For this house, the mains have a voltage of 220 V & the net current coming from the mains is 22 A.

- (a) What is the mode of connection to all the spaces in the house from the mains?
 (b) The spaces 5 and 4 have the same resistance and spaces 3 and 2 have respective resistances of $20\ \Omega$ and $30\ \Omega$. Space 1 has a resistance double that of space 5. What is the net resistance for space 5?
 (c) What is the current in space 3?
 (d) What should be placed between the main connection and the rest of the house's electrical appliances to save them from accidental high electric current?



SECTION-E

Questions No. 37 to 39 are case-based/data-based questions.

Q.37. Two students decided to investigate the effect of water and air on iron object under identical experimental conditions. They measured the mass of each object before placing it partially immersed in 10 ml of water. After a few days, the objects were removed, dried and their masses were measured. The table shows their result.

Student	Object	Mass of Object before Rusting in g	Mass of the coated object in g
A	Nail	3.0	3.15
B	Thin plate	6.0	6.33

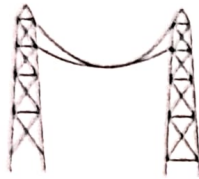
- (a) What might be the reason for the varied observations of the two students? 1
 (b) In another set up the students coated iron nails with zinc metal and noted that, iron nails coated with zinc prevents rusting. They also observed that zinc initially acts as a physical barrier, but an extra advantage of using zinc is that it continues to prevent rusting even if the layer of zinc is damaged. Name this process of rust prevention. 1
 (c) Give any *two* other methods to prevent rusting. 2

Or, (c) In which of the following applications of Iron, rusting will occur most? Support your answer with valid reason. 2

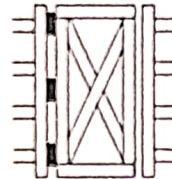
- A. Iron Bucket electroplated with Zinc
 B. Electricity cables having iron wires covered with aluminium
 C. Iron hinges on a gate
 D. Painted iron fence



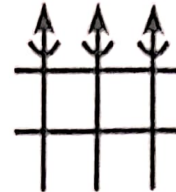
A



B



C



D

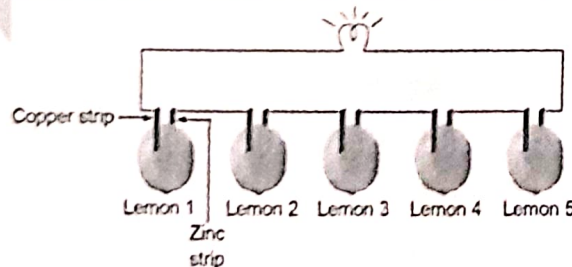
Q.38. India, the second most populous country of the world, harbours 17.5% of the world's population in only 2.4% of the global land mass. The population of our country is increasing rapidly day by day. It is very difficult to provide sufficient food, adequate clothing and proper education to all of them. To control the population growth, the government of India in April 1976, formed a National Population Policy and thus, fixed the marriageable age for females at 18 years and for males at 21 years.

Now answer the following questions on the basis of reading of this para: 4

- (a) Name the surgical method used in human females to prevent pregnancy. 1
 (b) In which year national Policy on Population was formed? 1
 (c) Name two methods to control human population. 2

Or, (c) Name the cycle in human females which reflects the reproductive phase. Also explain it. 2

Q.39. Sushma and her friend Anchal constructed a battery of cells using lemons and used it to light up an LED (Light Emitting Diode). For this they took 5 lemons, 5 thin strips of copper, 5 thin strips of zinc and LED copper connecting wires. They arranged the lemons in a line on the table and inserted one copper and one zinc strip in each of the lemons as shown in the given figure.



Sushma connected the zinc strip of first lemon with the copper strip of the second lemon and in this way she connected all the cells, leaving one copper strip free at the end of first lemon and one zinc strip at the end of last lemon.

Then Anchal connected LED between these free strips with the help of copper wires.

Now on the basis of reading of this para, answer the following questions: 4

- (a) What is the role of Lemon-juice in this set of Battery? 1
 (b) What current will flow through two resistors when connected in series combination with a battery? 1
 (c) Name the gases which are filled in the electric bulbs. 2

Or, (c) Which type of combination of resistors have same Potential difference across their two ends? 2

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